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Yeh et al.

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(45) **Date of Patent: Apr. 26, 2016**

(54) **METHOD OF IDENTIFYING EDGE SWIPE GESTURE AND METHOD OF OPENING WINDOW CONTROL BAR USING THE IDENTIFYING METHOD**

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(73) Assignee: **ELAN MICROELECTRONICS CORPORATION**, Hsin Chu (TW)

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(30) **Foreign Application Priority Data**

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Jul. 31, 2013 (TW) ..... 102127431 A

(51) **Int. Cl.**
G06F 3/041 (2006.01)
G06F 3/044 (2006.01)

(52) **U.S. Cl.**
CPC ***G06F 3/0416*** (2013.01); ***G06F 3/044*** (2013.01); *G06F 2203/04104* (2013.01); *G06F 2203/04108* (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

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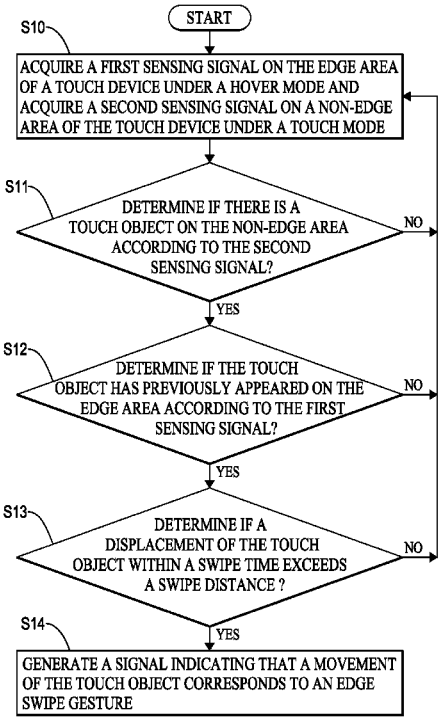
Primary Examiner — Joseph Haley
(74) *Attorney, Agent, or Firm* — patenttm.us

(57) **ABSTRACT**

A method of identifying edge swipe gesture has steps of respectively reading sensing signals on an edge area under a hover mode and on a non-edge area under a touch mode; determining if a touch object has appeared on the edge area after determining that the object has appeared on the non-edge area, calculating a displacement of the object moving from the edge area to the non-edge area within a preset time and determining if the displacement exceeds a preset distance, and determining that the movement of the touch is identified as an edge swipe gesture if the displacement meets the condition. Accordingly, the present invention can perform valid touch on the edge area, rendering effective identification of edge swipe gesture and an increased success rate of the identification.

32 Claims, 22 Drawing Sheets



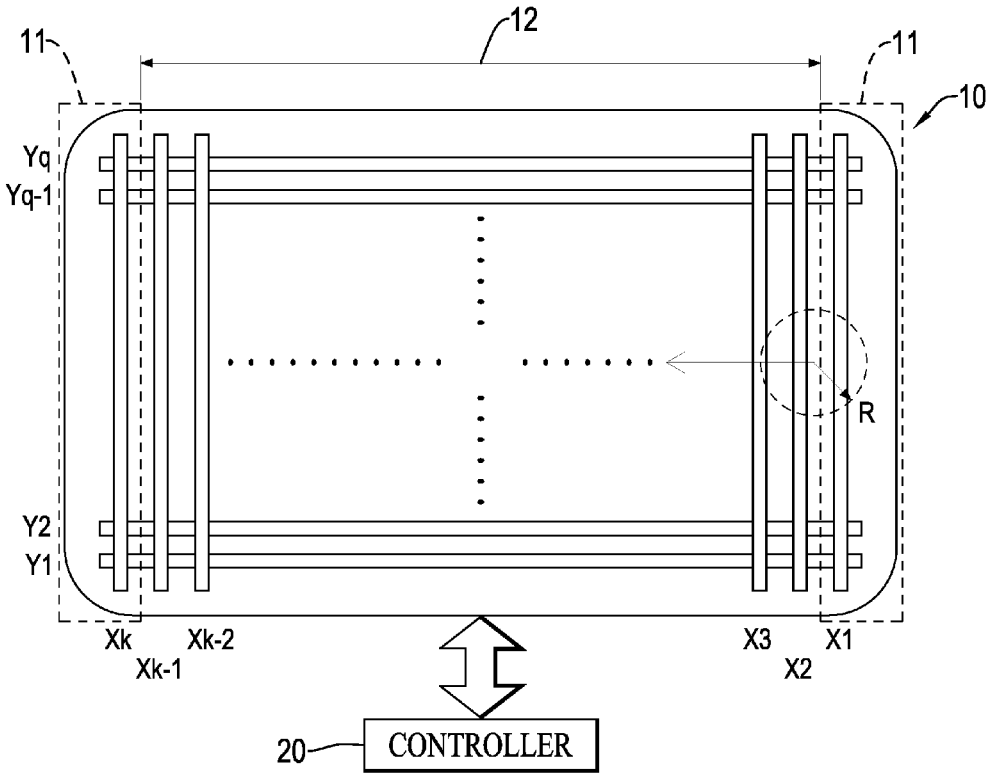


FIG.1A

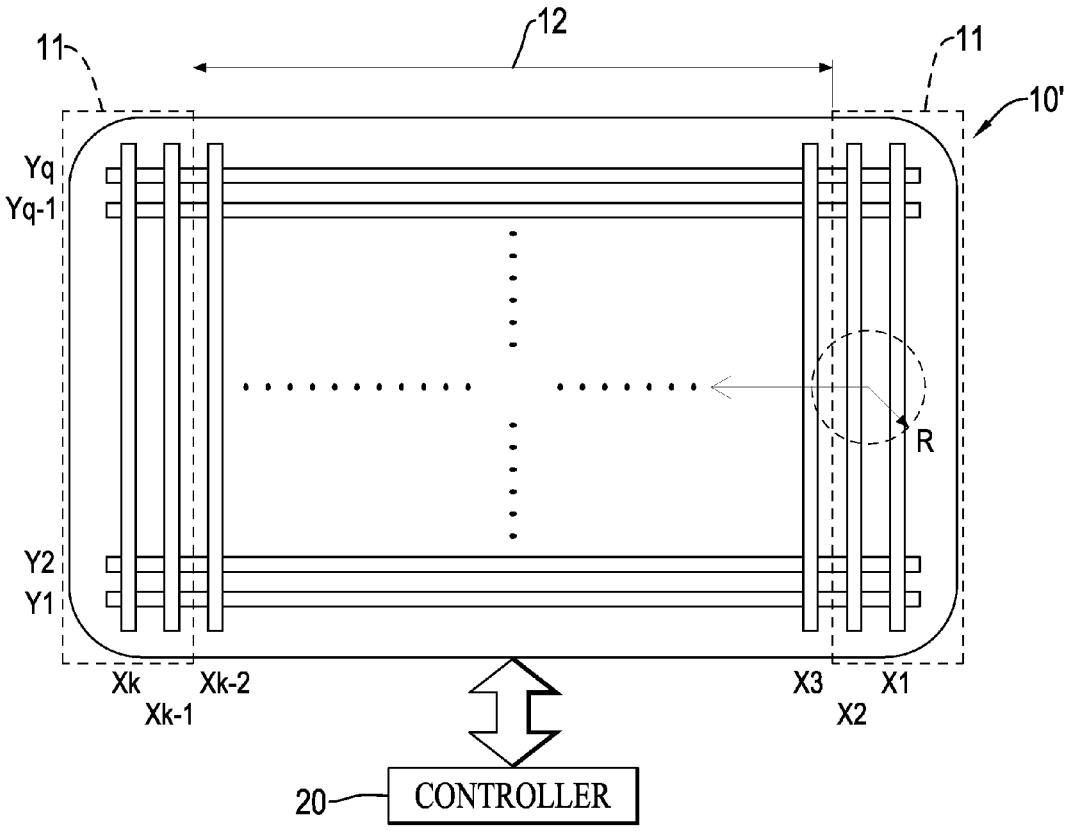


FIG.1B

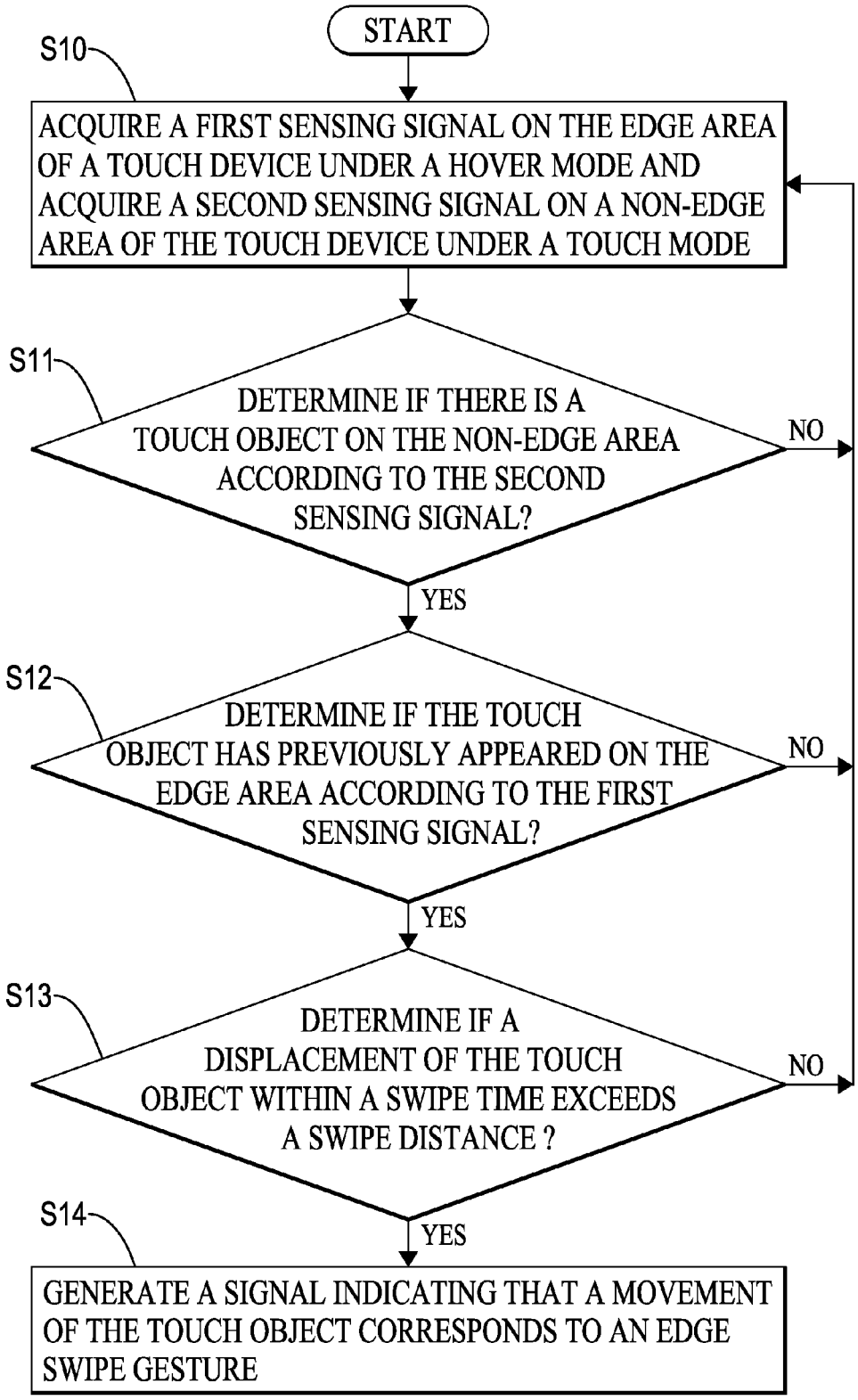

START
S10
ACQUIRE A FIRST SENSING SIGNAL ON THE EDGE AREA OF A TOUCH DEVICE UNDER A HOVER MODE AND ACQUIRE A SECOND SENSING SIGNAL ON A NON-EDGE AREA OF THE TOUCH DEVICE UNDER A TOUCH MODE
S11
DETERMINE IF THERE IS A TOUCH OBJECT ON THE NON-EDGE AREA ACCORDING TO THE SECOND SENSING SIGNAL?
NO
YES
S12
DETERMINE IF THE TOUCH OBJECT HAS PREVIOUSLY APPEARED ON THE EDGE AREA ACCORDING TO THE FIRST SENSING SIGNAL?
NO
YES
S13
DETERMINE IF A DISPLACEMENT OF THE TOUCH OBJECT WITHIN A SWIPE TIME EXCEEDS A SWIPE DISTANCE ?
NO
YES
S14
GENERATE A SIGNAL INDICATING THAT A MOVEMENT OF THE TOUCH OBJECT CORRESPONDS TO AN EDGE SWIPE GESTURE

FIG.2

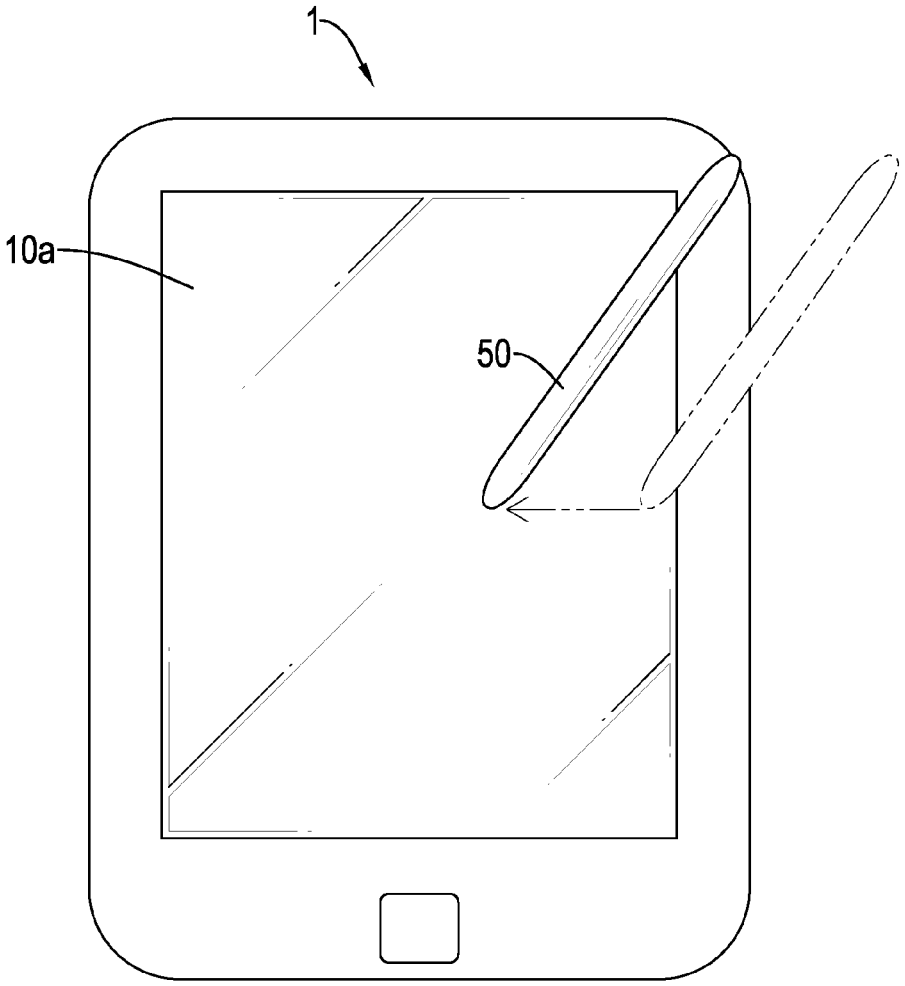


FIG.3A

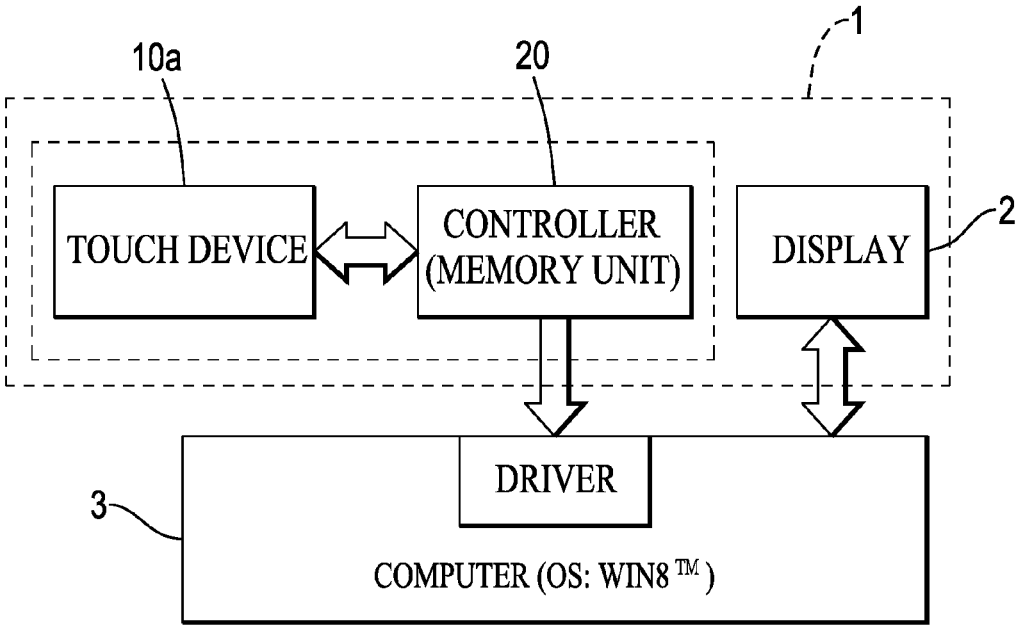

1
10a
20
TOUCH DEVICE
CONTROLLER
(MEMORY UNIT)
DISPLAY
2
DRIVER
3
COMPUTER (OS: WIN8 ™)

FIG.3B

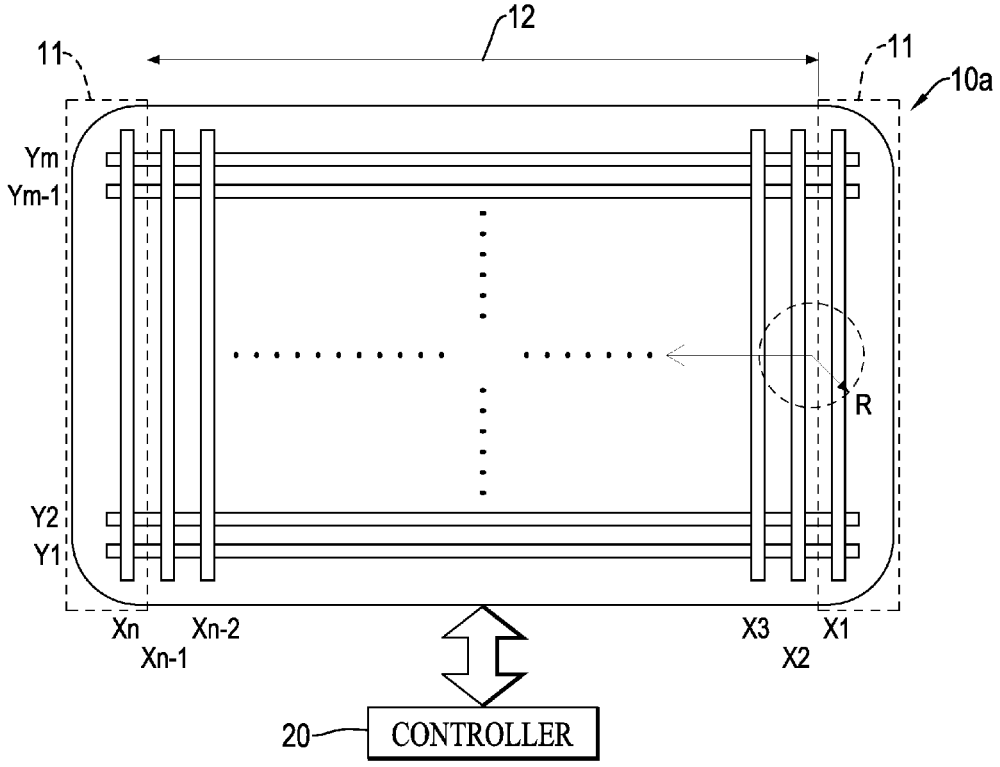


FIG.4A

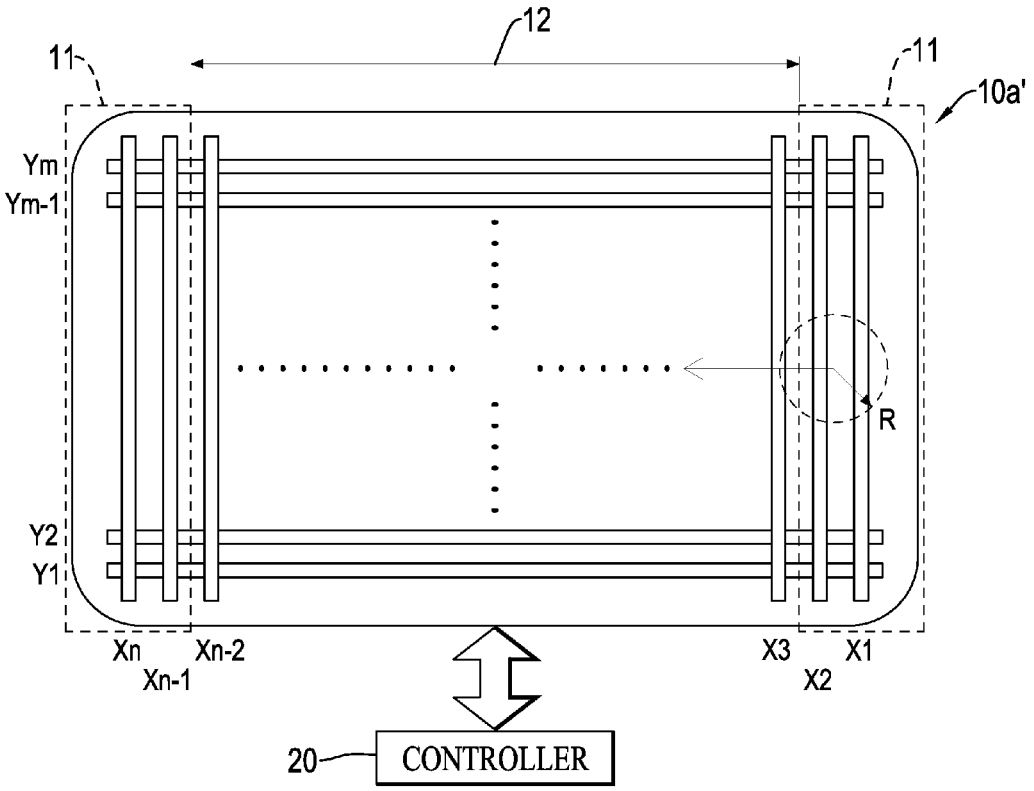


FIG.4B

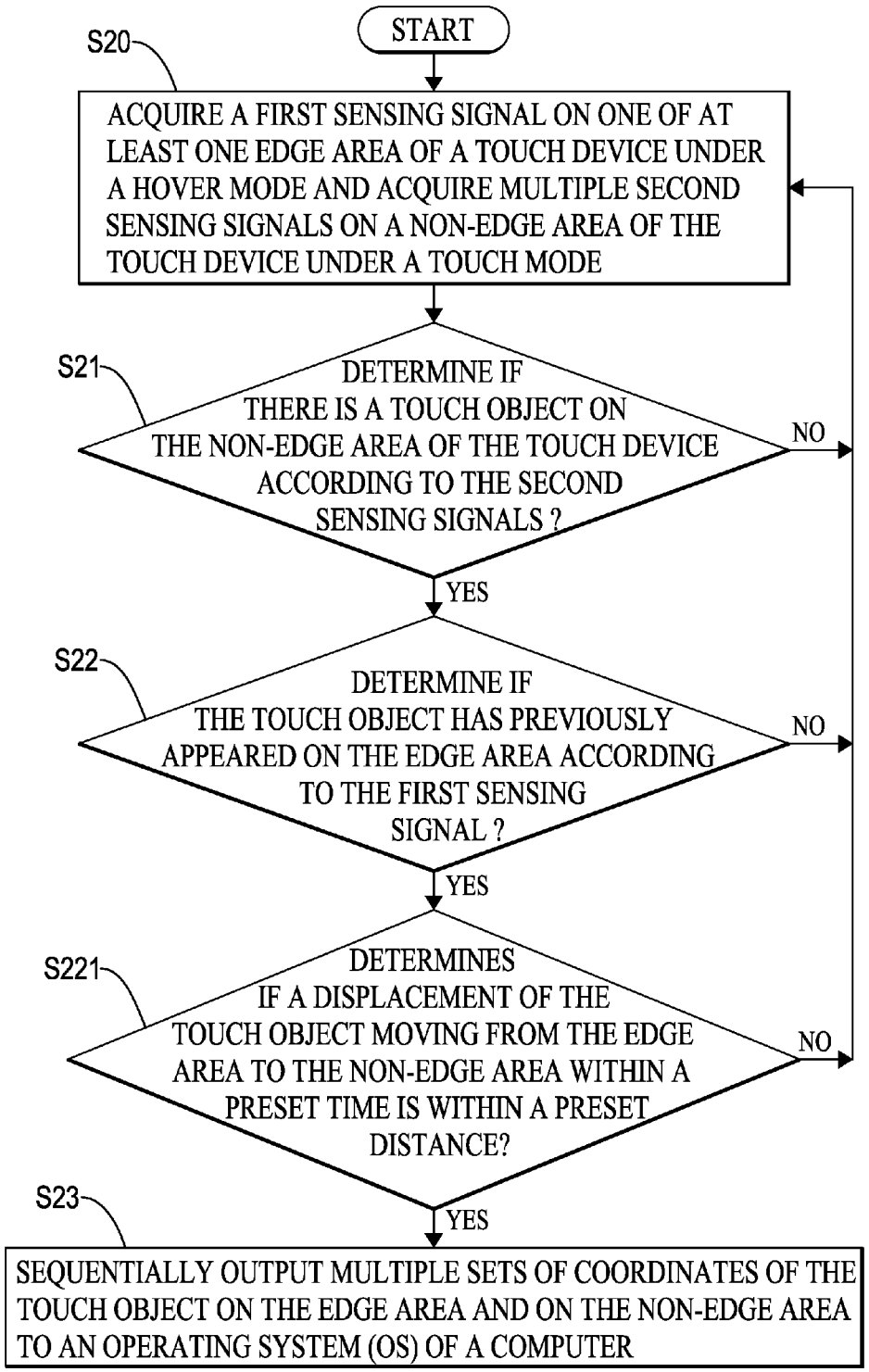

START
S20
ACQUIRE A FIRST SENSING SIGNAL ON ONE OF AT LEAST ONE EDGE AREA OF A TOUCH DEVICE UNDER A HOVER MODE AND ACQUIRE MULTIPLE SECOND SENSING SIGNALS ON A NON-EDGE AREA OF THE TOUCH DEVICE UNDER A TOUCH MODE
S21
DETERMINE IF THERE IS A TOUCH OBJECT ON THE NON-EDGE AREA OF THE TOUCH DEVICE ACCORDING TO THE SECOND SENSING SIGNALS ?
NO
YES
S22
DETERMINE IF THE TOUCH OBJECT HAS PREVIOUSLY APPEARED ON THE EDGE AREA ACCORDING TO THE FIRST SENSING SIGNAL ?
NO
YES
S221
DETERMINES IF A DISPLACEMENT OF THE TOUCH OBJECT MOVING FROM THE EDGE AREA TO THE NON-EDGE AREA WITHIN A PRESET TIME IS WITHIN A PRESET DISTANCE?
NO
YES
S23
SEQUENTIALLY OUTPUT MULTIPLE SETS OF COORDINATES OF THE TOUCH OBJECT ON THE EDGE AREA AND ON THE NON-EDGE AREA TO AN OPERATING SYSTEM (OS) OF A COMPUTER

FIG.5

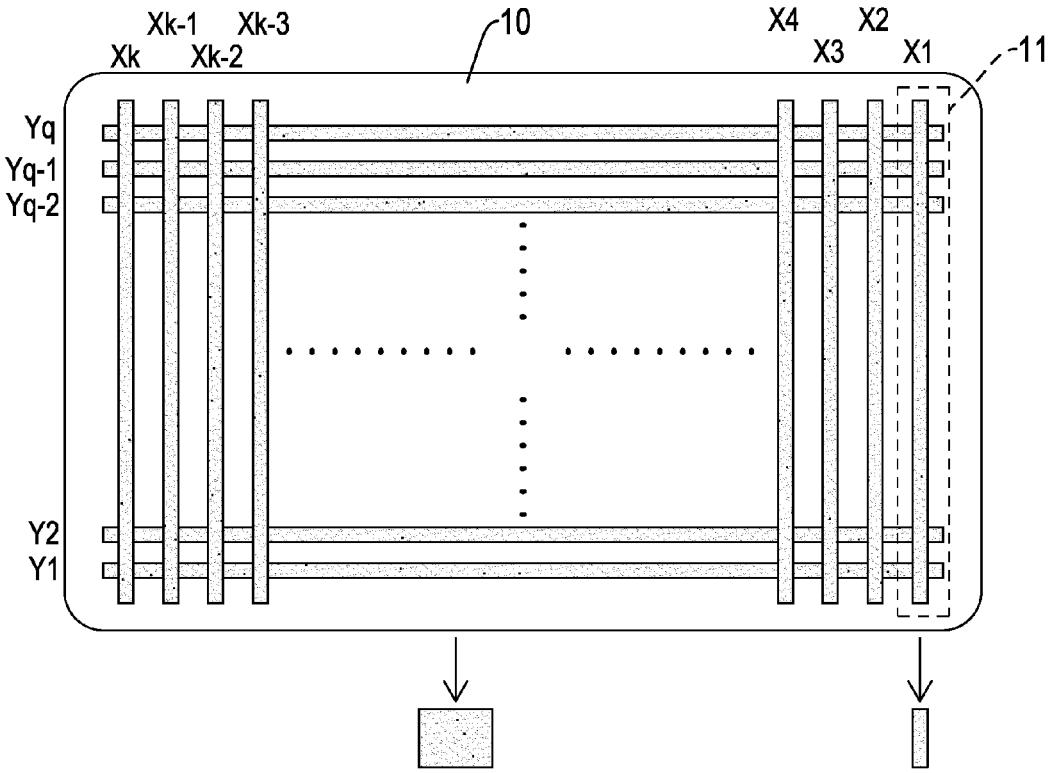


FIG.6A

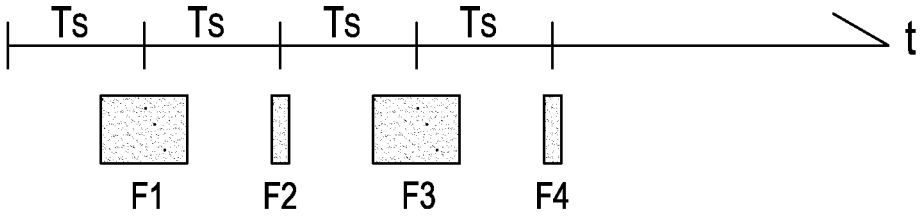


FIG.6B

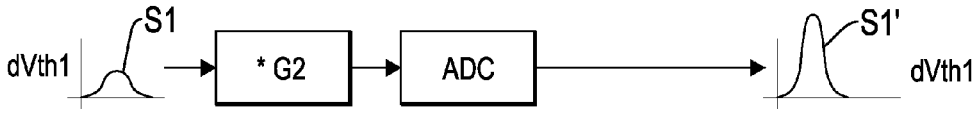


FIG.7A

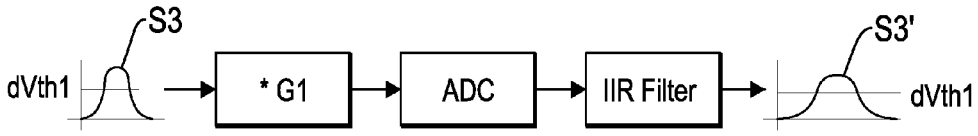


FIG.7B

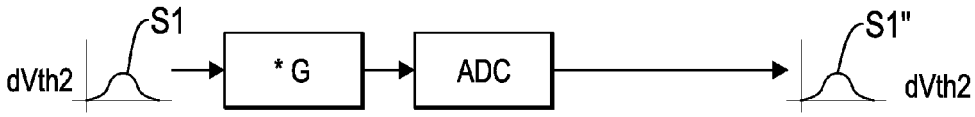


FIG.8A

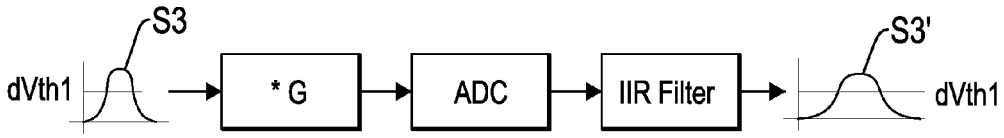


FIG.8B

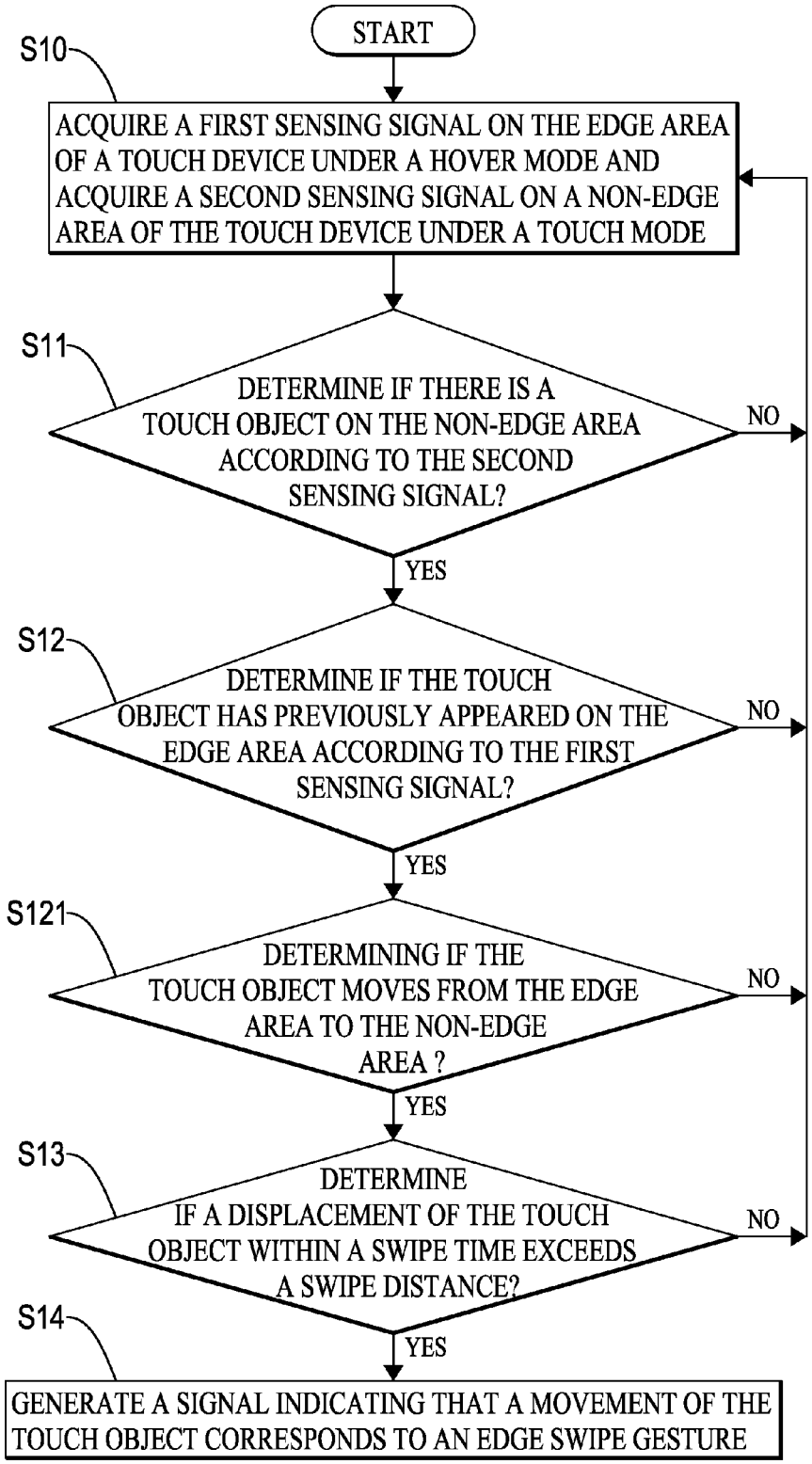

START
S10
ACQUIRE A FIRST SENSING SIGNAL ON THE EDGE AREA OF A TOUCH DEVICE UNDER A HOVER MODE AND ACQUIRE A SECOND SENSING SIGNAL ON A NON-EDGE AREA OF THE TOUCH DEVICE UNDER A TOUCH MODE
S11
DETERMINE IF THERE IS A TOUCH OBJECT ON THE NON-EDGE AREA ACCORDING TO THE SECOND SENSING SIGNAL?
NO
YES
S12
DETERMINE IF THE TOUCH OBJECT HAS PREVIOUSLY APPEARED ON THE EDGE AREA ACCORDING TO THE FIRST SENSING SIGNAL?
NO
YES
S121
DETERMINING IF THE TOUCH OBJECT MOVES FROM THE EDGE AREA TO THE NON-EDGE AREA ?
NO
YES
S13
DETERMINE IF A DISPLACEMENT OF THE TOUCH OBJECT WITHIN A SWIPE TIME EXCEEDS A SWIPE DISTANCE?
NO
YES
S14
GENERATE A SIGNAL INDICATING THAT A MOVEMENT OF THE TOUCH OBJECT CORRESPONDS TO AN EDGE SWIPE GESTURE

FIG.9

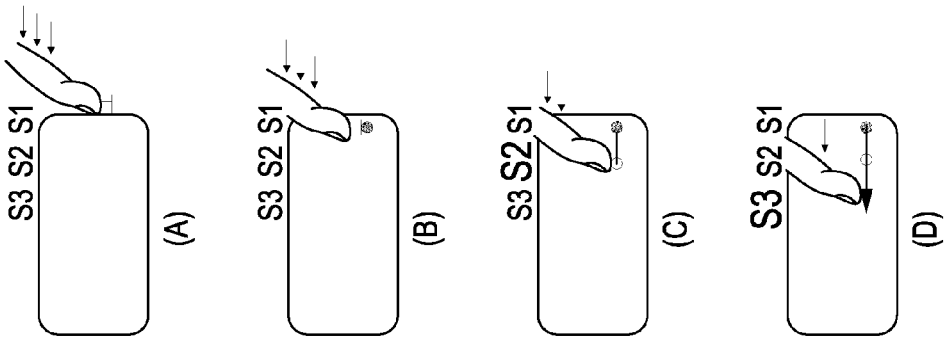


FIG.10-11

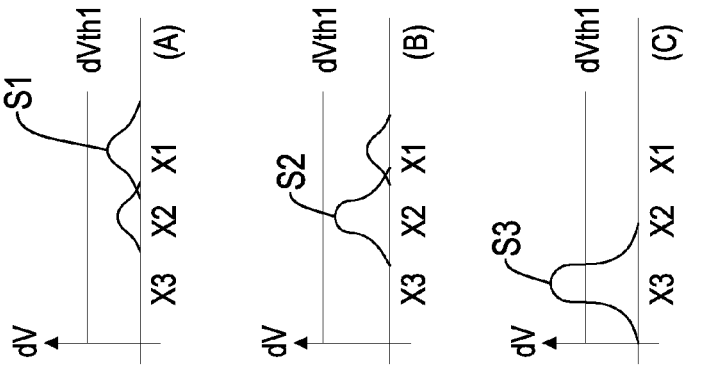


FIG.10-12

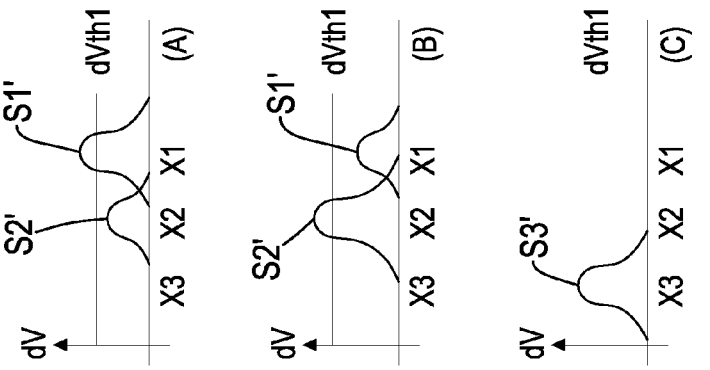


FIG.10-13

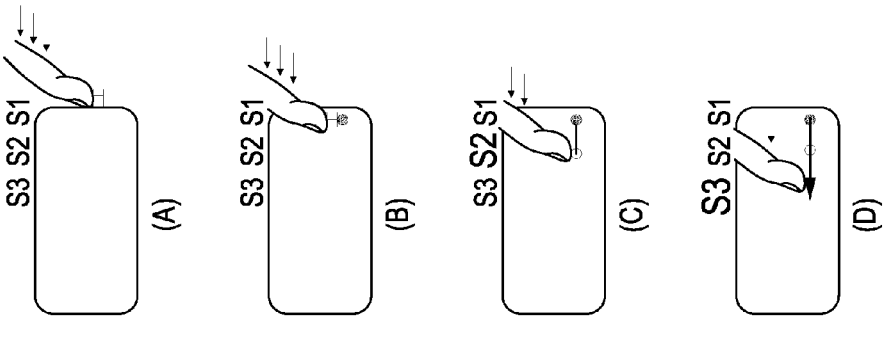


FIG.10-21

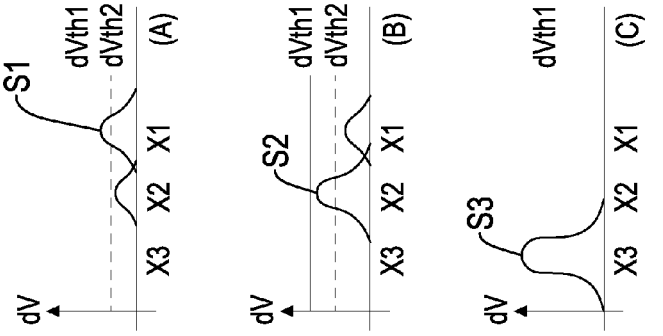


FIG.10-22

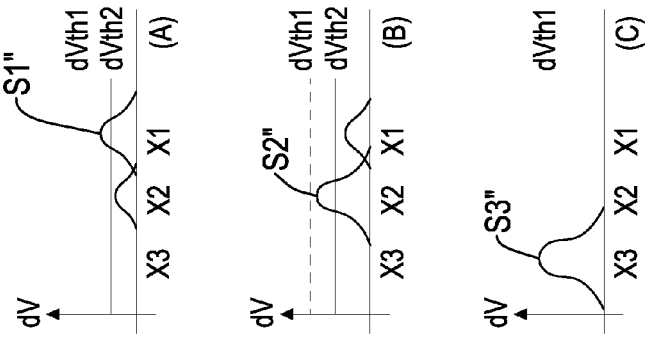


FIG.10-23

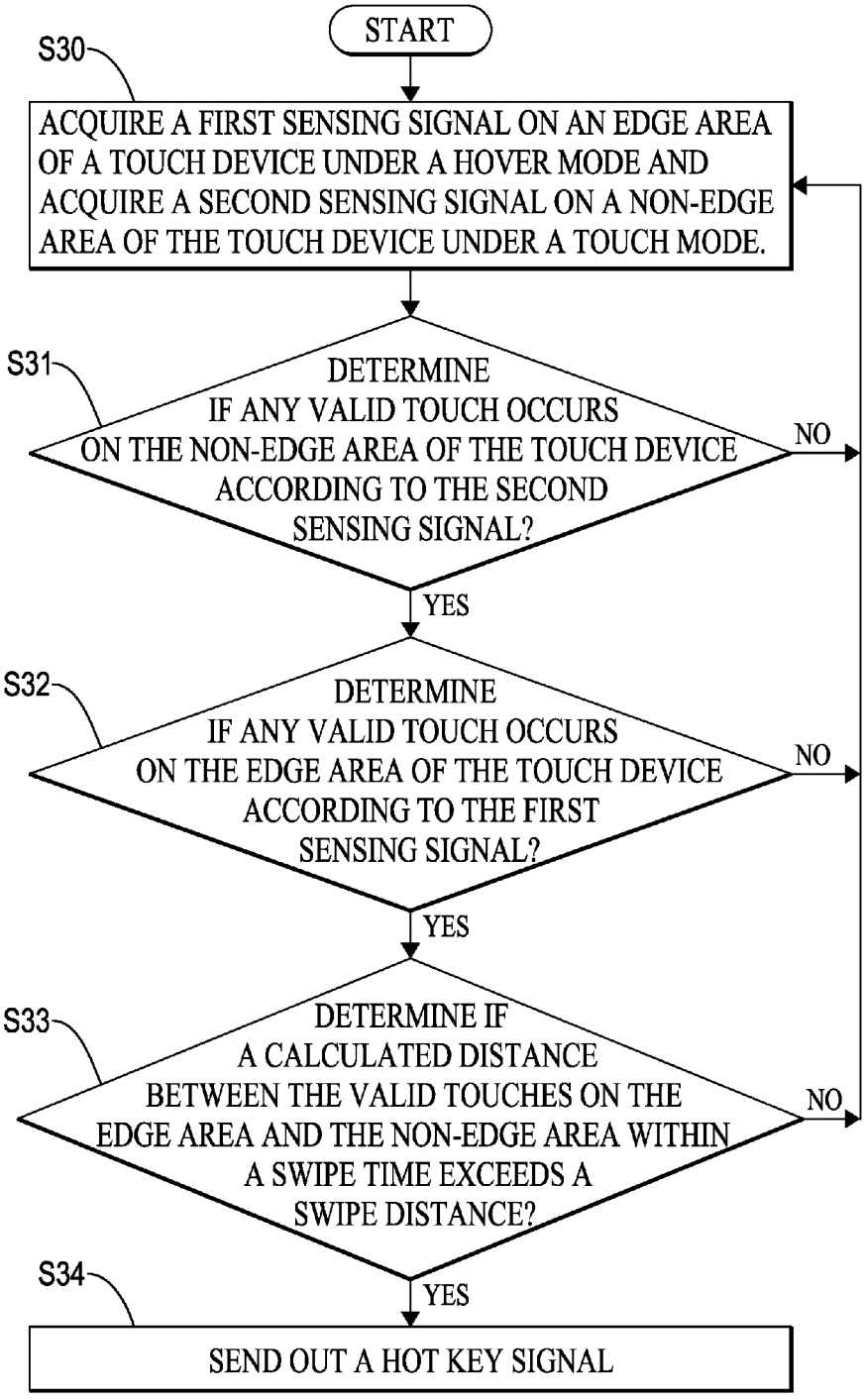

START
S30
ACQUIRE A FIRST SENSING SIGNAL ON AN EDGE AREA OF A TOUCH DEVICE UNDER A HOVER MODE AND ACQUIRE A SECOND SENSING SIGNAL ON A NON-EDGE AREA OF THE TOUCH DEVICE UNDER A TOUCH MODE.
S31
DETERMINE IF ANY VALID TOUCH OCCURS ON THE NON-EDGE AREA OF THE TOUCH DEVICE ACCORDING TO THE SECOND SENSING SIGNAL?
NO
YES
S32
DETERMINE IF ANY VALID TOUCH OCCURS ON THE EDGE AREA OF THE TOUCH DEVICE ACCORDING TO THE FIRST SENSING SIGNAL?
NO
YES
S33
DETERMINE IF A CALCULATED DISTANCE BETWEEN THE VALID TOUCHES ON THE EDGE AREA AND THE NON-EDGE AREA WITHIN A SWIPE TIME EXCEEDS A SWIPE DISTANCE?
NO
YES
S34
SEND OUT A HOT KEY SIGNAL

FIG.11

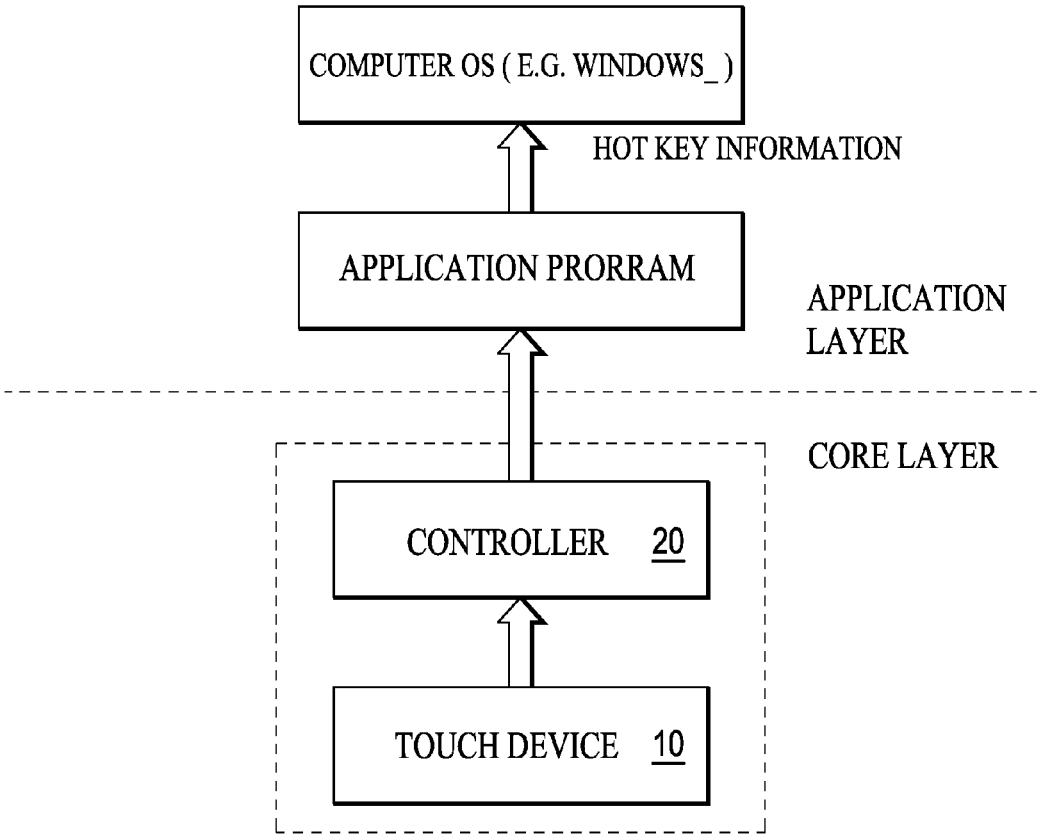

COMPUTER OS (E.G. WINDOWS_)
HOT KEY INFORMATION
APPLICATION PRORRAM
APPLICATION LAYER
CORE LAYER
CONTROLLER 20
TOUCH DEVICE 10

FIG.12

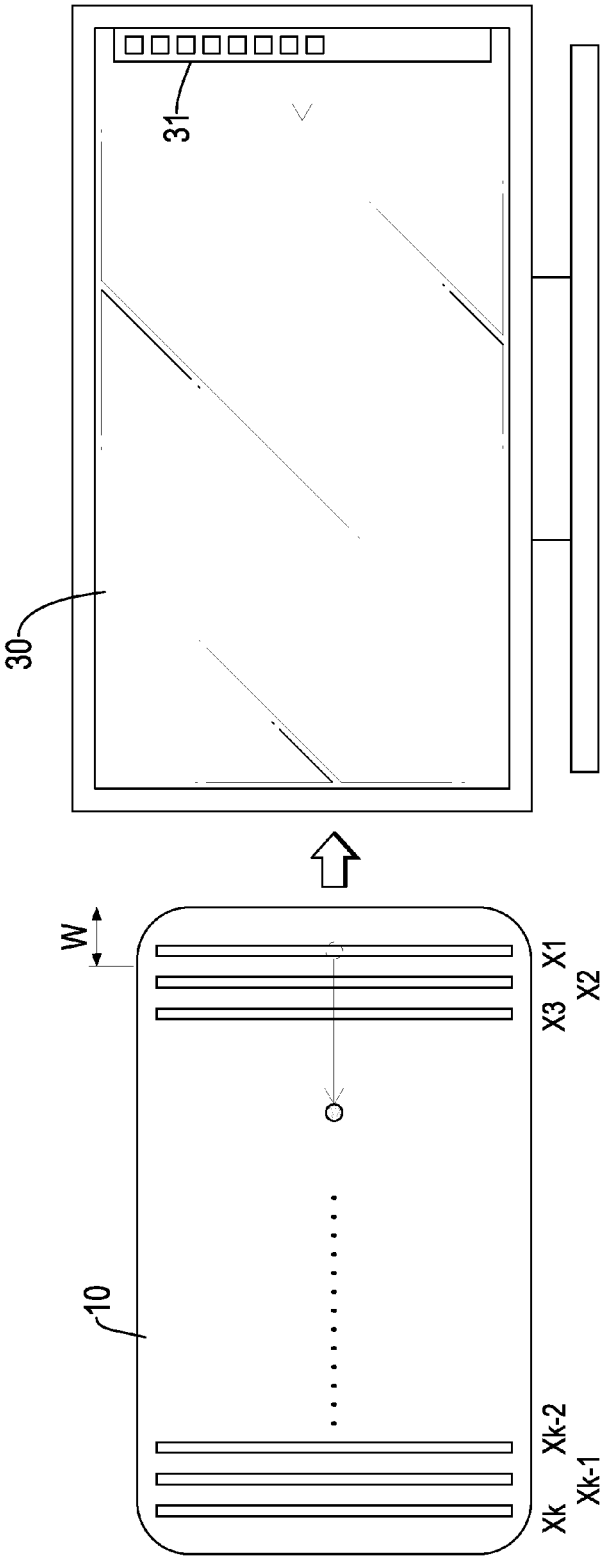


FIG.13

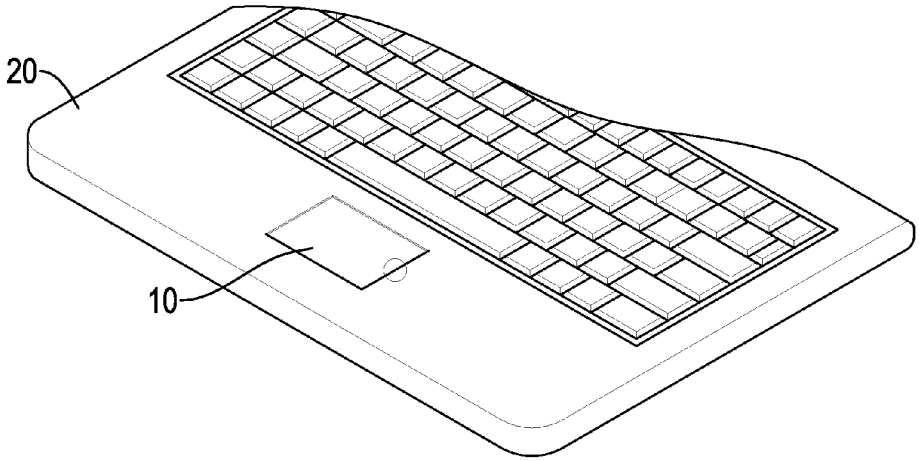


FIG.14A
PRIOR ART

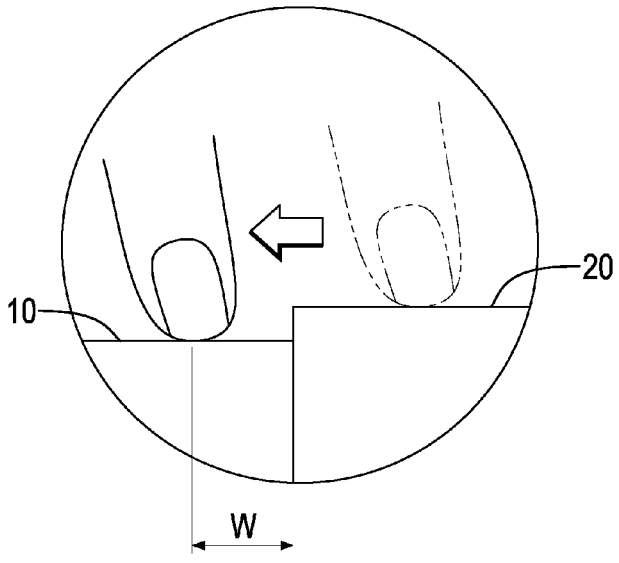


FIG.14B
PRIOR ART

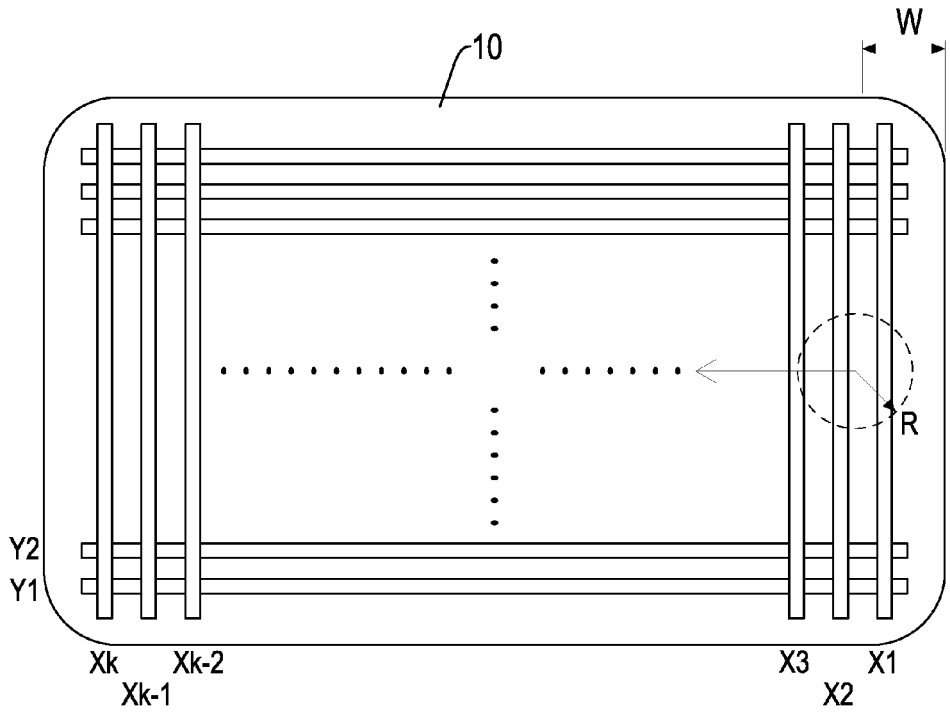


FIG.15
PRIOR ART

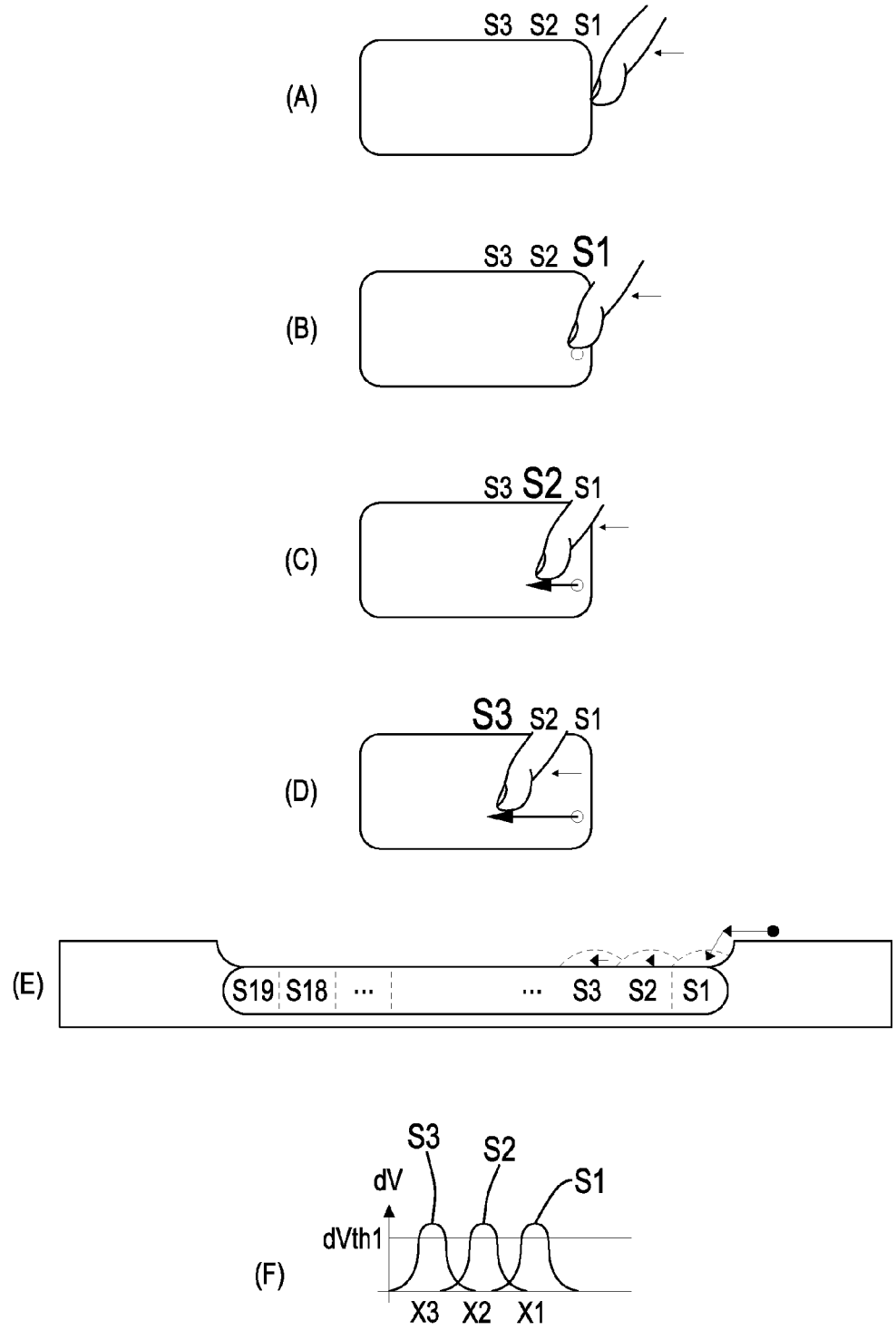


FIG.16
PRIOR ART

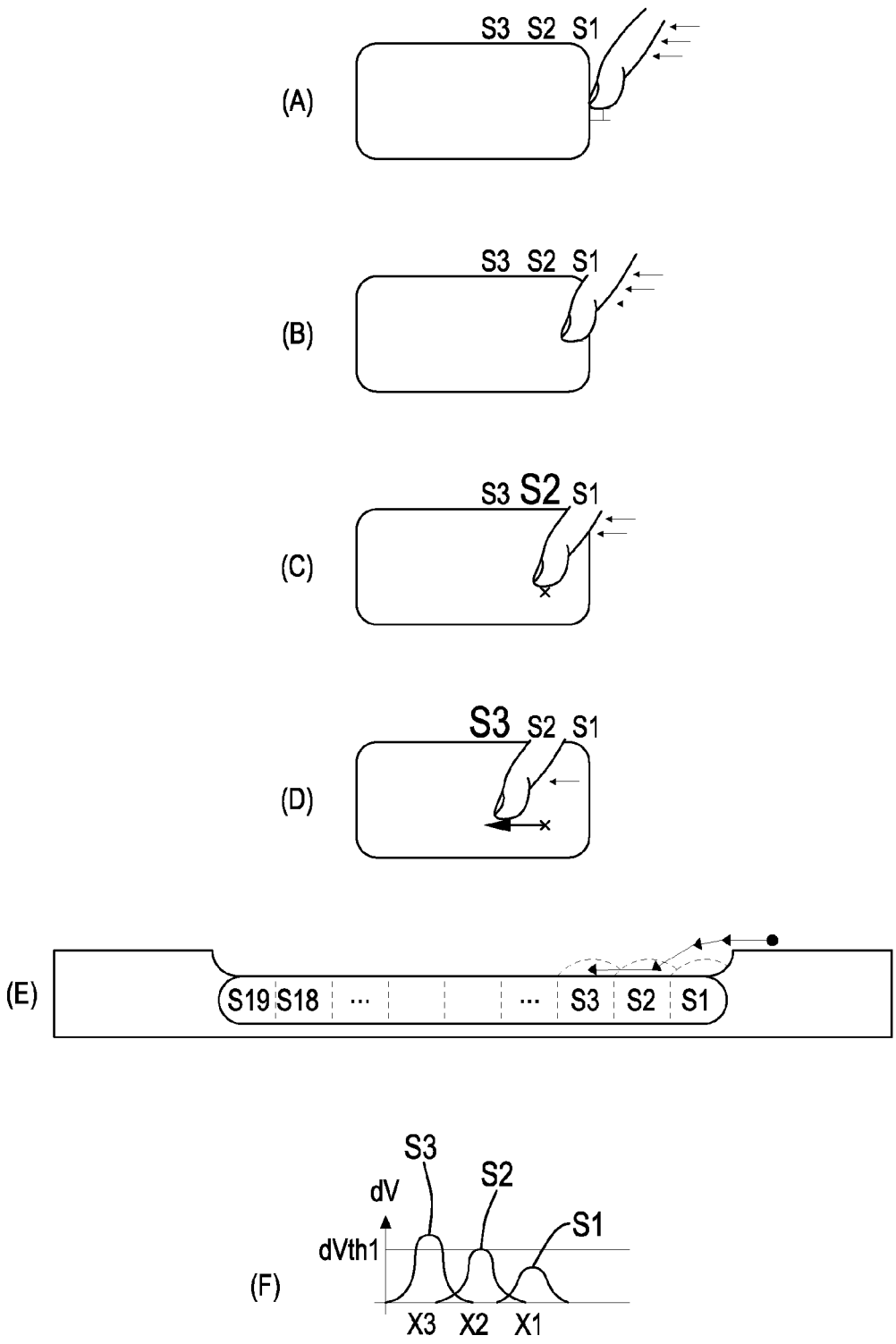


FIG.17
PRIOR ART

METHOD OF IDENTIFYING EDGE SWIPE GESTURE AND METHOD OF OPENING WINDOW CONTROL BAR USING THE IDENTIFYING METHOD

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a method of identifying edge swipe gesture, and more particularly to a method of identifying edge swipe gesture and a method of opening window control bar.

2. Description of the Related Art

Touch pads or external touch pads of notebook computers serve as an alternative to a physical mouse device, and is basically equipped with functions for controlling cursor, left button and right button on the computer systems. To keep abreast of software development of manufacturers of computer systems, such touch pads start providing a control function over edge swipe gesture. For example, when computer systems initialize a hidden menu function of a window environment and users are allowed to perform the control over cursor, left button and right button, the menu bar is initially in a hidden state. Once the touch pads detect that users' gestures pertain to edge swipe gestures, the computer systems will automatically display the hidden menu bar on the screens for users to pick. Besides, functions of switching pages on screens can be supported in a similar fashion.

Microsoft® has already laid the groundwork for the rules of determining edge swipe gestures. However, due to low accuracy in determining the edge swipe gestures, the touch pads incorporating the determination rules are not handy in use. The reason is described as follows.

With reference to FIGS. **14**A and **14**B, based on operational habits of users, a front left portion and a front right portion of a notebook computer with respect to users are usually designed as the left button and the right button. Pressing the front left portion and the front right portion can perform the functions of the left button and the right button. As to the control over edge swipe gestures, bordering portions adjacent to the left side, the right side, and the top side of the touch pad are defined for edge swipe gestures to occur. With reference to FIG. **15**, a touch device **10** capable of determining edge swipe gestures is configured with a bordering area W and a touch object-moving distance R, and a method of determining edge swipe gestures is performed under a touch mode. With reference to FIGS. **16**A to **16**D, when a finger moves inwards from outside the touch device **10** to firmly and sequentially touch a first sensing line to a third sensing line X**1**~X**3** of the touch device **10**, a first sensing signal to a third sensing signal S**1**~S**3** are sequentially outputted as shown in FIG. **16**E. The sensing values of the first sensing signal S**1** to the third sensing signal S**3** are greater than a sensing threshold dVth**1** as shown in FIG. **16**F. When the touch device **10** is determined by the touch mode for its sensing state, the first sensing line X**1** in the bordering area W can sense the finger thereon, the finger can be sensed to sequentially move from the first sensing line to the third sensing line X**1**~X**3** in an inward direction, and the finger is sensed to actually move a distance greater than the preset touch object-moving distance R in a period of time. Accordingly, the rules of determining edge swipe gestures are met, and the movement of the finger is determined as an edge swipe gesture.

With reference to FIG. **14**, the foregoing touch device **10** is combined with a case **20** of a notebook computer. If a top surface of the touch device **10** is not flush with a top surface of the case **20** and a finger swipes from the case **20** to the right side of the touch device **10** as shown in FIGS. **15**, **17**A and **17**B, the finger is not firmly pressing the sensing lines when the finger is on the first sensing line X**1** until the finger is on the second sensing line X**2** and the third sensing line X**3** as shown in FIGS. **17**C and **17**D. With reference to FIG. **17**F, although the first sensing line X**1** outputs a first sensing signal S**1** having a non-zero sensing value, the sensing value of the first sensing signal S**1** is lower than the sensing threshold dVth**1** in the touch mode. As there is no touch object identified to be on the bordering area, the rules of determining edge swipe gestures are not satisfied and no edge swipe gesture can be identified. Similar situation takes place when an area of a finger touching the bordering area is small. Since the sensing value of the first sensing signal S**1** outputted from the first sensing line X**1** is lower than the sensing threshold dVth**1**, the finger's movement fails to be identified as an edge swipe gesture, and the hidden menu bar is unable to be displayed on the screen of a window environment.

SUMMARY OF THE INVENTION

In view of the technical shortcomings in the forgoing conventional method of identifying edge swipe gesture lacking sensitive identification of edge swipe gestures, the objective of the present invention is to provide a method of identifying edge swipe gesture and a method of opening window control bar with a high success rate in identifying edge swipe gesture.

To achieve the foregoing objective, the method of identifying edge swipe gesture is performed by a controller of a touch device, and has steps of:

acquiring at least one first sensing signal on an edge area of the touch device under a hover mode;

acquiring multiple second sensing signals on a non-edge area of the touch device under a touch mode;

determining if there is a touch object on the non-edge area according to the second sensing signals, and when there is a touch object on the non-edge area, determining if the touch object has previously appeared on the edge area according to the at least one first sensing signal;

determining if a displacement of the touch object within a swipe time exceeds a swipe distance when the touch object has previously appeared on the edge area; and

generating a signal indicating that a movement of the touch object corresponds to an edge swipe gesture when the displacement of the touch object within the swipe time exceeds the swipe distance.

The foregoing method employs the hover mode and the touch mode to respectively acquire sensing signals on the edge area and the non-edge area of a touch pad. Each single sensing frame is generated by converting the sensing signals on the edge area and on the non-edge edge. As being sensitive to small sensing value, the hover mode is used to acutely sense a touch object, such as a finger or stylus, swiping through the edge area. When users swipe through the touch pad with the touch object from one edge of the touch pad, despite the failure of touching the edge area or small contact area with the edge area, users' swiping movement can be identified by the hover mode. After the swiping distance and time are calculated and meet the requirements of edge swipe gesture, users' edge swipe gesture can be correctly identified as an edge swipe gesture.

To achieve the foregoing objective, the method of opening window control bar through identification of edge swipe gesture is performed by a controller of a touch device, and has steps of:

acquiring at least one first sensing signal on an edge area of the touch device under a hover mode;

acquiring multiple second sensing signals on a non-edge area of the touch device under a touch mode;

determining if a valid touch of a touch object occurs on the non-edge area of the touch device according to the second sensing signals;

when the valid touch of the touch object occurs on the non-edge area, determining if a valid touch of the touch object occurs on the edge area of the touch device according to the at least one first sensing signal;

when the valid touch of the touch object occurs on the edge area, determining if a distance between the valid touches on the edge area and the non-edge area within a swipe time exceeds a swipe distance; and

when the distance exceeds the swipe distance, sending out a signal to an operating system for the operating system to open a corresponding control bar.

The foregoing method employs the hover mode and the touch mode to respectively acquire sensing signals on the edge area and the non-edge area of the touch device. Being sensitive to small sensing value, the hover mode is used to accurately sense a touch object, such as a finger or stylus, swiping through the edge area so as to identify the sensed movement as a valid touch. After the swiping distance and time are calculated and meet the requirements of edge swipe gesture, users' edge swipe gesture can be correctly identified and a signal, such as a hot key signal, can then be sent to an operating system. The operating system will open a corresponding window control bar according to the signal to achieve a higher success rate for correctly opening a window control bar through the identification of edge swipe gesture.

To achieve the foregoing objective, another method of identifying edge swipe gesture is performed by a controller of a touch device, and has steps of:

acquiring at least one first sensing signal on an edge area of the touch device under a hover mode;

acquiring multiple second sensing signals on a non-edge area of the touch device under a touch mode;

determining if there is a touch object on the non-edge area according to the second sensing signals, and when there is a touch object on the non-edge area, determining if the touch object has previously appeared on the edge area according to the at least one first sensing signal; and

when the touch object has previously appeared on the edge area according to the at least one first sensing signal, sequentially outputting multiple sets of coordinates of the touch object on the edge area and on the non-edge area to an operating system for the operating system to identify a swipe gesture.

Similarly, the foregoing method also employs the hover mode and the touch mode to respectively acquire sensing signals on the edge area and the non-edge area of the touch device to increase the identification rate of users' edge swipe gesture except when the touch device is used as a touch screen. After a swiping movement is identified, the coordinates of the object on the edge area and on the non-edge area are sequentially outputted to the operating system of the computer for the operating system to make final determination of edge swipe gesture.

To achieve the foregoing objective, a major technical approach is to provide a touch system for converting a user's operation command into a signal launching a window control bar through an operating system of a computer in the touch system, and the touch system has a computer, a touch device, a display and a controller.

The computer has an operating system installed thereon.

The touch device is electrically connected to the computer and has an edge area and a non-edge area.

The edge area extends inwards a distance from an edge of the touch device.

The display is electrically connected to the computer.

The controller is electrically connected to the touch device and the computer, generates a signal for launching a window control bar after a touch object hovers on the edge area of the touch device and then touches the non-edge area of the touch device, and outputs the signal to the computer for the operating system of the computer to display a window control bar on the display.

The controller of the foregoing touch system in collaboration with the touch device can fulfill the foregoing two methods of identifying edge swipe gesture and output a signal for launching window control bar to the computer after an edge swipe gesture is identified. The operating system of the computer then opens a window control bar on the display according to the signal.

Other objectives, advantages and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1**A is a schematic view of a first embodiment of a touch device applied to a touch pad in accordance with the present invention;

FIG. **1**B is a schematic view of a second embodiment of a touch device applied to a touch pad in accordance with the present invention;

FIG. **2** is a flow diagram of a first embodiment of a method of identifying edge swipe gesture performed on the touch device in FIG. **1**A;

FIG. **3**A is a schematic view of a touch screen to which the touch devices in FIGS. **1**A and **1**B are applied;

FIG. **3**B is a functional block diagram of the touch screen in FIG. **3**A;

FIG. **4**A is a schematic view of a first embodiment of a touch device with a touch screen in accordance with the present invention;

FIG. **4**B is a schematic view of a second embodiment of a touch device with a touch screen in accordance with the present invention;

FIG. **5** is a flow diagram of a second embodiment of a method of identifying edge swipe gesture performed on the touch screen of the touch device in FIG. **4**A;

FIGS. **6**A and **6**B are schematic views showing generation of an effective sensing frame in accordance with the present invention;

FIG. **7**A is a schematic diagram showing a process of a first signal processed on an edge area of a touch panel in accordance with the present invention;

FIG. **7**B is a schematic diagram showing a process of a first signal processed on a non-edge area of a touch panel in accordance with the present invention;

FIG. **8**A is a schematic diagram showing a process of a second signal processed on an edge area of a touch panel in accordance with the present invention;

FIG. **8**B is a schematic diagram showing a process of a second signal processed on a non-edge area of a touch device in accordance with the present invention;

FIG. **9** is a flow diagram of a third embodiment of a method of identifying edge swipe gesture performed on the touch device in FIG. **1**B;

FIGS. **10-11**A to **10-11**D are schematic views of finger movements associated with an edge swipe gesture on a touch device in accordance with the present invention;

FIGS. **10-12**A to **10-12**C are waveform diagrams of sensing signals at corresponding finger locations in FIGS. **10-11**B to **10-11**D;

FIGS. **10-13**A to **10-13**C are waveform diagrams of signal-processed sensing signals in FIGS. **10-12**A to **10-12**C;

FIGS. **10-21**A to **10-21**D are schematic views of finger movements associated with an edge swipe gesture on a touch device in accordance with the present invention;

FIGS. **10-22**A to **10-22**C are waveform diagrams of sensing signals at corresponding finger locations in FIGS. **10-21**B to **10-21**D;

FIGS. **10-23**A to **10-23**C are waveform diagrams of signal-processed sensing signals in FIGS. **10-22**A to **10-22**C;

FIG. **11** is a flow diagram of a method of opening window control bar in accordance with the present invention;

FIG. **12** is a schematic diagram showing signal conversion after outputting a control signal to an operating system in accordance with the present invention;

FIG. **13** is a schematic view of opening a window control bar on a touch device in accordance with the present invention;

FIG. **14**A is a schematic view of a conventional touch pad mounted on a housing of a notebook computer;

FIG. **14**B is a partially enlarged operational schematic view of the conventional touch pad in FIG. **14**A;

FIG. **15** is a schematic view of a conventional touch pad;

FIGS. **16**A to **16**D are schematic views of finger movements associated with an edge swipe gesture on a conventional touch device;

FIGS. **16**E to **16**F are waveform diagrams of sensing signals in FIGS. **16**A to **16**D;

FIGS. **17**A to **17**D are schematic views of finger movements associated with an edge swipe gesture not touching an outmost sensing line of a conventional touch device; and

FIGS. **17**E to **17**F are waveform diagrams of sensing signals in FIGS. **17**A to **17**D.

DETAILED DESCRIPTION OF THE INVENTION

The present invention targets at increasing success rate of identifying swipe gesture on a touch device and can be also applied to open window control bar for users to increase a success rate in opening window control bar. The touch devices of the present invention are applicable to touch panels or touch screens.

With reference to FIG. **1**A, a first embodiment of a touch device **10** in accordance with the present invention has multiple sensing lines along a first axis X**1**~Xk, multiple sensing lines along a second axis Y**1**~Yq, and a controller **20** electrically connected to the sensing lines along the first axis and the second axis X**1**~Xk, Y**1**~Yq. The controller **20** drives the sensing lines along the first axis and the second axis X**1**~Xk, Y**1**~Yq by means of a self scan approach or a mutual scan approach, receives sensing signals of the sensing lines along the first axis and the second axis X**1**~Xk, Y**1**~Yq, and identifies if there is any effective touch or touch object on the touch device **10** according to the sensing signals. The touch device **10** has at least one edge area **11** and a non-edge area **12** defined on the touch device **10**. The edge area **11** is defined as an area extending a distance leftwards from a right edge of the touch device **10** or extending a distance rightwards from a left edge of the touch device **10**. When applied to a notebook computer, the touch device **10** further has an edge area extending a distance downwards from a top edge of the touch device **10**. Each of the at least one edge area **11** contains a single sensing line X**1**, Xk or Yq being parallel to a nearest edge of the touch device **10**. With reference to FIG. **1**B, the touch device **10'** has at least one edge area **11**, and each of the at least one edge area **11** contains two or more than two sensing lines X**1**/X**2**, Xk−1/Xk or Yq−1/Yq being parallel to a length direction of a corresponding edge area **11**. Preferably, the edge area **11** is the edge area specified by the "edge swipe gesture control functions" of WIN8™. The non-edge area **12** is defined as an area other than the at least one edge area **11** on the touch device **10**, **10'**.

With reference to FIG. **2**, a first embodiment of a method of identifying edge swipe gesture in accordance with the present invention is performed by the controller **20** and has the following steps.

Step S**10**: Acquire a first sensing signal on the edge area **11** of the touch device **10** under a hover mode and acquire a second sensing signal on an entire area of the touch device **10** under a touch mode.

Step S**11**: Determine if there is a touch object on the non-edge area **12** according to the second sensing signal, if positive, perform step S**12**, and otherwise, resume step S**10**.

Step S**12**: Determine if the touch object has previously appeared on the edge area **11** according to the first sensing signal. In other words, determine if the first sensing signal has varied in response to the presence of the touch object on the edge area **11**. If the determination result of step S**12** is positive, perform step S**13**. Otherwise, resume step S**10**.

Step S**13**: Determine if a displacement of the touch object within a swipe time exceeds a swipe distance. In other words, determine if a distance between two positions of the touch object on the edge area **11** and on the non-edge area **12** exceeds the swipe distance within the swipe time. Preferably, the swipe time and the swiping distance meet the specifications of the "edge swipe gesture control functions" in WIN8™. If the determination result of step S**13** is positive, perform step S**14**. Otherwise, resume step S**10**.

Step S**14**: Generate a signal indicating that the movement of the touch object corresponds to an edge swipe gesture.

With reference to FIG. **3**A, a touch device **10***a* is a touch screen **1**. With reference to FIG. **3**B, the touch screen **1** has a display **2**. The touch device **10***a* is electrically connected to a controller **20**. The controller **20** is electrically connected to the display **2** of the touch screen **1** through a computer **3**. With reference to FIG. **4**A, the touch device **10***a* has multiple sensing lines along a first axis and a second axis X**1**~Xn, Y**1**~Ym and a controller electrically connected to the sensing lines along the first axis and the second axis X**1**~Xn, Y**1**~Ym. The controller **20** drives the sensing lines along the first axis and the second axis X**1**~Xn, Y**1**~Ym by means of a self scan approach or a mutual scan approach, receives sensing signals of the sensing lines along the first axis and the second axis X**1**~Xn, Y**1**~Ym, and identifies if there is any touch object on the touch device **10***a* according to the sensing signals. Each of the at least one edge area **11** contains a single sensing line X**1**, Xn, Y**1** or Ym being parallel to a nearest edge of the touch device **10**. With reference to FIG. **4**B, the touch device **10***a'* has at least one edge area **11**, and each of the at least one edge area **11** contains two or more than two sensing lines X**1**/X**2**, Xn−1/Xn or Y**1**/Y**2** being parallel to a length direction of a corresponding edge area **11**.

With reference to FIG. **5**, a second embodiment of a method of identifying edge swipe gesture in accordance with the present invention is performed by the controller **20** and has the following steps.

Step S**20**: Acquire at least one first sensing signal on the edge area **11** of the touch device **10***a* under a hover mode and acquire multiple second sensing signals on an entire area **12** of the touch device **10***a* under a touch mode.

Step S21: Determine if there is a touch object on the non-edge area 12 of the touch device 10*a* according to the second sensing signals, if positive, perform step S22, and otherwise, resume step S20.

Step S22: Determine if the touch object has previously appeared on the edge area 11 according to the first sensing signal. In other words, determine if any touch object was present on the edge area 11 according to the first sensing signal. If the determination result of step S22 is positive, perform step S23. Otherwise, resume step S20.

Step S23: Sequentially output multiple sets of coordinates of the touch object on the edge area 11 and on the non-edge area 12 to the operating system (OS) of the computer 3 for the OS to identify a swipe gesture.

Moreover, to increase the accuracy of the OS in identifying a swipe gesture, the controller 20 can further perform a step S221 after step S22 to set up a preset time that is not greater than the swipe time and a preset distance that is not greater than the swipe distance. When determining the touch object has appeared on both the edge area 11 and the non-edge area 12 in step S21, the controller 20 further determines if a displacement of the touch object moving from the edge area 11 to the non-edge area 12 within the preset time is within the preset distance. If the determination result is positive, it indicates that a swipe gesture may be identified, and the controller 20 further performs step S22. If the determination result is negative, the controller 20 only outputs the current set of coordinates of the touch object on the non-edge area 12 to the computer 3. To determine whether the displacement is within the preset distance, the controller 20 takes the first set of coordinates of the touch object on the non-edge area 12 and the any set of coordinates of the touch object or the last set of coordinates of the touch object on the edge area 11 to calculate the displacement, and compares the displacement with the preset distance to determine if the displacement is within the preset distance in step S221. Step S221 aims to eliminate the gesture using two fingers to respectively tap the edge area 11 and the non-edge area 12 in a sequential manner to enhance the accuracy in identifying a swipe gesture. Step 23 serves to sequentially output the coordinates of the touch object according to the time sequence when the touch object moves from the edge area 11 to the non-edge area 12. As sequentially receiving the coordinates of the touch object when the touch object moves from the edge area 11 to the non-edge area 12, the OS of the computer 3 can determine if the displacement of the touch object moving from the edge area 11 to the non-edge area 12 within the swipe time has exceeded a swipe distance within a swipe time, in which the swipe time and the swipe distance are specified in the "edge swipe gesture control functions" in WIN8™. If the displacement has exceeded the swipe distance within the swipe time, it indicates that current user's gesture is a swipe gesture.

To sum up, when users' swipe movement approaches the edge area 11, instead of immediately receiving the coordinates of the touch object on the edge area 11 transmitted from the controller 20, the OS of the computer 3 receives coordinates of the touch object on the edge area 11 only after the controller 20 identifies the presence of the object on the non-edge area 12, thereby effectively enhancing the correctness of the computer in identifying swipe gesture. As the involved processing time is rather short, users will not actually feel the time delay arising from the processing.

With reference to FIGS. 1A, 4A, 6A and 6B, the controller 20 of the touch device 10, 10' scans the sensing lines along the first axis and the second axis X1~Xn, Y1~Ym using a scan cycle Ts to sequentially generate sensing frames F1~F4. The controller 20 may process sensing signals under a hover mode and a touch mode. With reference to FIG. 6B, the sensing frame F1 is obtained by processing the sensing signals over the entire area of the touch device 10, 10' under the touch mode, and the sensing frame F2 is obtained by processing the sensing signals over the edge area 11 of the touch device 10, 10' under the hover mode. The following description explains how to implement the different hover mode and touch mode.

With reference to FIGS. 7A and 7B, a first implementation of the touch mode and the hover mode is shown. During a step of reading the first sensing signal on the edge area 11 of the touch device 10, 10' under the hover mode, the controller 20 reads the sensing signals on the edge area 11 of the touch device 10, 10' detected within each scan cycle Ts as illustrated in 1A and 3A to read the sensing signal S1 of the rightmost sensing line X1. With further reference to FIG. 7A, each sensing signal S1 of the sensing line X1 on the edge area 11 is multiplied by a hover sensitivity parameter G2. Each sensing signal after the multiplication is converted by a digital conversion into the first sensing signal S1' in generation of the sensing frames F2, F4 in FIG. 6B.

As to the step of reading the second sensing signal over the entire area of the touch device 10, 10' under the touch mode, with reference to FIG. 7B, the controller 20 reads the sensing signals on the entire area of the touch device 10, 10' detected within each scan cycle Ts, multiplies each sensing signal S3 by a touch sensitivity parameter G1, converts the sensing signal after the multiplication with an analog-to-digital conversion (ADC), and filters the sensing signal after the ADC through a digital filter, such as IIR (Infinite Impulse Response) filter. The controller 20 further computes a standard deviation or a mean by referring to previous one or previous few sensing frames with the entire area of the touch device scanned, so as to obtain the second sensing signal S3'. As the hover sensitivity parameter is greater than the touch sensitivity parameter (G2>G1), the sensing signals on the edge area 11 are amplified.

When swiping through one edge of the touch device 10, 10', a user's finger is able to approach but fails to touch the sensing line X1 on the edge area 11 due to the height difference at the edge of the touch device 10, 10'. Hence, the sensing signal sensed at the sensing line X1 is relatively weaker and is lower than a touch sensing threshold dVth1. However, after the signal processing step as shown in FIG. 7A under the hover mode, the sensing signal S1 is amplified with gain enhancement to become the first sensing signal S1'. Therefore, during the step of determining if the touch object has appeared on the edge area by means of the first sensing signal S1', the first sensing signal S1' sensed within the edge area 11 can be directly determined if it is greater than the touch sensing threshold dVth1. If the first sensing signal S1' is greater than the touch sensing threshold dVth1, the touch object is identified to have appeared within the edge area 11. As to the touch object identification on the non-edge area 12, the second sensing signal S3' is similarly compared with the touch sensing threshold dVth1. If the second sensing signal S3' is also greater than the touch sensing threshold dVth1, the touch object is identified to be present on the touch device.

With reference to FIGS. 8A and 8B, a second implementation of the touch mode and the hover mode is shown. During the step of reading the first sensing signal S1" on the edge area 11 of the touch device 10, 10' under the hover mode, the sensing signal S1 read on the sensing line X1 of the edge area 11 is multiplied by a sensitivity parameter G. The sensing signal after the multiplication is converted into the first sensing signal S1" by an analog-to-digital conversion. Each sensing signal on the non-edge area of the touch device 10, 10' sensed under the touch mode is also multiplied by the sensi-

tivity parameter G. The sensing signal after the multiplication is converted by an analog-to-digital conversion (ADC). The sensing signal after the ADC is filtered by a digital filter, such as an IIR filter. The controller **20** further computes a standard deviation or a mean by referring to previous one or previous few sensing frames with the entire area of the touch device scanned, so as to obtain the second sensing signal S**3**'. It is noted from FIGS. **8**A and **8**B that the sensing values of the sensing signals filtered by the digital filter slightly drop. To successfully identify the weaker first sensing signal S**1**", the controller **20** in FIGS. **1**A and **3**A will set up a first sensing threshold (same as the touch sensing threshold dVth**1**) and a second sensing threshold (dVth**2**). The second sensing threshold is less than the first sensing threshold (dVth**2**<dVth**1**). As long as the first sensing signal S**1**" is greater than the second sensing threshold, the first sensing signal S**1**" can still be considered to be valid.

With reference to FIG. **9**, a third embodiment of a method of identifying edge swipe gesture in accordance with the present invention is substantially the same as the method illustrated in FIG. **2**, and adopts a first implementation of combining the touch mode and the hover mode as illustrated in FIGS. **10-11**D, **10-12**C and **10-13**C. When the sensing signal S**3**' on the non-edge area of the touch device has been signal-processed and is determined that its sensing value has exceeded the touch sensing threshold dVth**1**, the controller **20** identifies the touch object present on the non-edge area of the touch device and further determines if the touch object is present on the edge area according to previous two sensing frames. The present embodiment is performed on the touch device in FIG. **1**B. Hence, a step S**121** of determining if the touch object moves from the edge area **11** to the non-edge area **12** is additionally included in the step S**12**. In other words, the moving direction of the touch object is determined by the variations of the first sensing signals S**1**', S**2**' on the two sensing lines X**1**, X**2** on the edge area **11** according to the previously-generated first sensing frame and second sensing frame. Specifically, the finger-moving direction is illustrated in FIGS. **10-11**A to **10-11**D. With reference to FIGS. **10-11**B and **10-11**C, when the finger swipes through but does not touch the edge area **11**, the sensing signals of the sensing lines X**1**, X**2** are illustrated in FIGS. **10-12**A and **10-12**B. Before undergoing the gain-enhancing signal processing, both sensing values of the sensing signals S**1** of the sensing line X**1** in the consecutive two scanning results do not exceed the touch sensing threshold dVth**1**. Both the sensing values of the first sensing signals S**1** and the second sensing signal S**2** on the sensing lines X**1**, X**2** in the consecutive first and second sensing frames, which are illustrated in FIGS. **10-13**A and **10-13**B and generated after the gain-enhancing signal processing, exceed the touch sensing threshold dVth**1**. Subsequently, the moving direction of the touch object is to be determined. As the sensing value of the first sensing signal S**1**' on the sensing line X**1** is greater than the sensing value of the first sensing signal S**2**' on the sensing line X**2** as illustrated in FIG. **10-13**A in the first sensing frame and the sensing value of the first sensing signal S**1**' on the sensing line X**1** is less than the sensing value of the first sensing signal S**2**' on the sensing line X**2** as illustrated in FIG. **10-13**B in the second sensing frame, the touch object is determined to move from the edge area **11** to the non-edge area **12**.

An second implementation of combining the touch mode and the hover mode can be employed to determine if any touch object is present on the edge area. Similarly, as illustrated in FIGS. **10-21**D, **10-22**C and **10-23**C, determining if a touch object is present on the edge area of the touch device takes place after determining that the touch object is identified on the non-edge area according to the sensing signal S**3**". With reference to FIGS. **10-21**B and **10-21**C, when a finger swipes through but does not touch the edge area **11** due to the height difference at the edge of the touch device, the sensing signals of the sensing lines X**1**, X**2** are illustrated as in FIGS. **10-22**A and **10-22**B. In the consecutive first and second sensing frames generated after the signal processing in the hover mode as illustrated in FIGS. **10-23**A and **10-23**B, although not being greater than the first sensing threshold dVth**1**, the sensing values of the first sensing signals S**1**", S**2**" already exceed the second sensing threshold dVth**2**. Subsequently, the moving direction of the touch object is to be determined. As the sensing value of the first sensing signal S**1**" on the sensing line X**1** is greater than the sensing value of the first sensing signal S**2**" on the sensing line X**2** as illustrated in FIG. **10-23**A in the first sensing frame and the sensing value of the first sensing signal S**1**" on the sensing line X**1** is less than the sensing value of the first sensing signal S**2**" on the sensing line X**2** as illustrated in FIG. **10-23**B in the second sensing frame, the touch object is determined to move from the edge area **11** to the non-edge area **12**.

The edge area on the touch device **10***a*' applied to the touch screen **1** in FIG. **4**B has two or more than two sensing lines. Hence, step S**121** in FIG. **9** can be added between steps S**22** and S**221** in FIG. **5** to determine if the touch object moves from the edge area to the non-edge area, and step S**221** is performed only after the determination result in step **121** is positive.

The foregoing methods of identifying edge swipe gesture employ the hover mode and the touch mode to perform signal processing on the sensing signals on the edge area **11** and the non-edge area **12** of the touch device **10**, **10**' so as to facilitate swipe gesture determination and increase the success rate in identifying edge swipe gesture by means of touch information detected under the hover mode. Such technique is also applicable to a method of opening window control bar. With reference to FIG. **11**, the method of opening window control bar has the following steps.

Step S**30**: Acquire a first sensing signal on an edge area **11** of the touch device **10**, **10**' under a hover mode and acquire a second sensing signal on an entire area of the touch device **10**, **10**' under a touch mode.

Step S**31**: Determine if any valid touch occurs on the non-edge area **12** of the touch device **10**, **10**' according to the second sensing signal. If the determination result is positive, perform step S**32**. Otherwise, resume step S**30**.

Step S**32**: Determine if any valid touch occurs on the edge area **11** of the touch device **10**, **10**' according to the first sensing signal. If the determination result is positive, perform step S**33**. Otherwise, resume step S**30**.

Step S**33**: Determine if a calculated distance between the valid touches on the edge area **11** and the non-edge area **12** within a swipe time exceeds a swipe distance. If the determination result is positive, perform step S**34**. Otherwise, resume step S**30**. In a preferred implementation of the step **33**, a distance between an initial position of one of the valid touches on the edge area and a last position of another valid touch on the touch device is calculated, and the distance is determined if exceeding the swipe distance.

Step S**34**: Send out a hot key signal. The hot key signal is sent to an OS for the OS to open a corresponding window control bar. Additionally, a step of determining the valid touch moves from the edge area **11** to the non-edge area **12** can be added.

To fulfill the foregoing steps, with reference to FIG. **12**, the controller **20** of the touch device **10**, **10**' performs steps S**20**-S**23** in a kernel layer therein, and outputs the coordinates (X,

Y) of the valid touches to an application program operated on the highest application layer (user interface) for the application program to determine if an edge swipe gesture is identified according to the coordinates of the valid touches. When an edge swipe gesture is identified, the controller **20** generates a hot key signal corresponding to the edge swipe gesture and sends the hot key signal to the user interface of WIN8™. After receiving the hot key signal, a computer with WIN8™ installed thereon performs a function corresponding to the hot key signal. An example is illustrated in FIG. **13**. When users make a left swipe from the right edge of the touch panel, once the swipe movement is successfully identified, the controller **20** of the touch device **10**, **10'** in FIG. **1**A or **1**B outputs a signal to an application. After identifying the swipe movement as an edge swipe gesture, the application outputs a hot key signal specified by WIN8™, which is equivalent to the hot key signal generated by simultaneously pressing the "WINDOWS" key and the "C" key on a standard keyboard, for the OS to receive the hot key signal. The computer then controls to display a window control bar **31** on a right edge of a screen **30** of a display. If the application identifies that the swipe movement is an edge swipe gesture moving from left to right so as to open the window control bar **31** on a left edge of the screen **30**, the application then outputs a hot key signal specified by WIN8™, which is equivalent to the hot key signal generated by simultaneously pressing the "WINDOWS" key and the "Tab" key on a standard keyboard. If the application identifies that the swipe movement is an edge swipe gesture moving from top to bottom so as to open the window control bar **31** on a top edge of the screen **30**, the application then outputs a hot key signal specified by WIN8™, which is equivalent to the hot key signal generated by simultaneously pressing the "WINDOWS" key and the "Z" key on a standard keyboard. The foregoing description includes, but is not limited to, a feasible approach of identifying edge swipe gesture and opening window control bar.

In sum, the present invention respectively reads the sensing signals on the edge area and on the non-edge area of the touch device using the hover mode and the touch mode, determines if the signal-processed first sensing signal has varied after determining that a valid touch occurs on the non-edge area, and determines that a valid touch has already occurred on the edge area before the valid touch occurring on the non-edge area if the first sensing signal has varied so as to identify an edge swipe gesture. As the hover mode can sense weak sensing value of the sensing signals, using the hover mode in the present invention can sense the finger or stylus swiping through the edge area with higher degree of dexterity so as to easily identify a valid touch. Once the calculations of the swipe distance and swipe time meet the requirements of an edge swipe gesture, the present invention can correctly identify users' swiping movement and send a hot key signal to an OS for the OS to open a corresponding control bar, thereby increasing the success rate in identifying edge swipe gesture and opening a control bar.

Even though numerous characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and function of the invention, the disclosure is illustrative only. Changes may be made in detail, especially in matters of shape, size, and arrangement of parts within the principles of the invention to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.

What is claimed is:

1. A method of identifying edge swipe gesture performed by a controller of a touch device, the method comprising steps of:

acquiring at least one first sensing signal on an edge area of the touch device under a hover mode;

acquiring multiple second sensing signals on an entire area of the touch device under a touch mode;

determining if there is a touch object on the non-edge area according to the second sensing signals, and when there is a touch object on the non-edge area, determining if the touch object has previously appeared on the edge area according to the at least one first sensing signal;

determining if a displacement of the touch object within a swipe time exceeds a swipe distance when the touch object has previously appeared on the edge area; and

generating a signal indicating that a movement of the touch object corresponds to an edge swipe gesture when the displacement of the touch object within the swipe time exceeds the swipe distance.

2. The method as claimed in claim **1**, wherein

the edge area has at least one sensing line; and

the step of acquiring the at least one first sensing signal under the hover mode has steps of:

multiplying a sensing signal of each of the at least one sensing line on the edge area by a hover sensitivity parameter; and

converting the sensing signal after the multiplication into one of the at least one first sensing signal.

3. The method as claimed in claim **2**, wherein the step of determining if the touch object has previously appeared on the edge area has steps of:

determining if a sensing value of any one of the at least one first sensing signal on the edge area within a previous sensing frame is greater than a touch sensing threshold; and

determining that the touch object has previously appeared on the edge area when the sensing value of the first sensing signal on the edge area within the previous sensing frame is greater than the touch sensing threshold.

4. The method as claimed in claim **3**, wherein

the edge area has multiple sensing lines; and

the step of determining if the sensing value of any one of the at least one first sensing signal on the edge area is greater than the touch sensing threshold has a step of when the sensing value of the first sensing signal of at least one of the sensing lines on the edge area is greater than the touch sensing threshold, comparing variations of the first sensing signals of the sensing lines on the edge area within a first sensing frame and a second sensing frame previously read to determine a moving direction of the touch object, wherein the first sensing frame is read earlier than the second sensing frame.

5. The method as claimed in claim **4**, wherein

the multiple sensing lines of the edge area include a first sensing line and a second sensing line; and

in the step of comparing variations of the first sensing signals, when the sensing value of the first sensing signal of the first sensing line is greater than the sensing value of the first sensing signal of the second sensing line within the first sensing frame and the sensing value of the first sensing signal of the first sensing line is less than the sensing value of the first sensing signal of the second sensing line within the second sensing frame, determining that the touch object moves from the edge area to the non-edge area, wherein the first sensing line is located between an edge of the touch device and the second sensing line.

6. The method as claimed in claim **2**, wherein

the entire area has multiple sensing lines; and

the step of acquiring the second sensing signals on the non-edge area of the touch device under the touch mode has steps of:

reading multiple sensing signals of the sensing lines on the entire area;

multiplying the sensing signal of each sensing line on the non-edge area with a touch sensitivity parameter and converting the sensing signal after the multiplication by an analog-to-digital conversion (ADC), wherein the touch sensitivity parameter is less than the hover sensitivity parameter; and

filtering the sensing signal on the entire area after the ADC to obtain a corresponding second sensing signals.

7. The method as claimed in claim **6**, wherein the step of determining if there is a touch object on the non-edge area according to the second sensing signals further has a step of determining if a sensing value of any second sensing signal is greater than the touch sensing threshold, and if the sensing value of any second sensing signal is greater than the touch sensing threshold, determining that the touch object is identified on the non-edge area.

8. The method as claimed in claim **1**, wherein

the edge area has at least one sensing line; and

the step of acquiring the at least one first sensing signal on the edge area of the touch device under the hover mode has steps of:

multiplying a sensing value of a sensing signal of each of the at least one sensing line on the edge area by a sensitivity parameter; and

converting the sensing signal of the sensing line on the edge area after the multiplication into a corresponding first sensing signal through an ADC.

9. The method as claimed in claim **8**, wherein

the entire area has multiple sensing lines; and

the step of acquiring multiple second sensing signals on the entire area of the touch device under the touch mode has steps of:

reading a sensing signal of each sensing line on the entire area;

multiplying a sensing value of the sensing signal of each sensing line on the entire area by the sensitivity parameter and converting the sensing signal of the sensing line on the entire area after the multiplication through the ADC; and

filtering the sensing signal on the entire area after the ADC to obtain a corresponding second sensing signal.

10. The method as claimed in claim **9**, wherein

the step of determining if the touch object has previously appeared on the edge area according to the at least one first sensing signal has steps of:

determining if a sensing value of any one of the at least one first sensing signal within the edge area in a previous sensing frame is greater than a second sensing threshold; and

when the sensing value of the first sensing signal in the previous sensing frame is greater than the second sensing threshold, determining that the touch object has previously appeared on the edge area; and

the step of determining if there is a touch object on the non-edge area according to the second sensing signals has steps of:

determining if a sensing value of any second sensing signal is greater than a first sensing threshold, wherein the first sensing threshold is greater than the second sensing threshold; and

when the sensing value of the second sensing signal is greater than the first sensing threshold, determining that the touch object is identified on the non-edge area.

11. The method as claimed in claim **1**, wherein one of the at least one sensing line of the edge area is parallel to a length direction of the edge area.

12. The method as claimed in claim **2**, wherein one of the at least one sensing line of the edge area is parallel to a length direction of the edge area.

13. The method as claimed in claim **3**, wherein one of the at least one sensing line of the edge area is parallel to a length direction of the edge area.

14. The method as claimed in claim **4**, wherein the multiple sensing lines of the edge area are parallel to a length direction of the edge area.

15. The method as claimed in claim **5**, wherein the multiple sensing lines of the edge area are parallel to a length direction of the edge area.

16. A method of identifying edge swipe gesture performed by a controller of a touch device, the method comprising steps of:

acquiring at least one first sensing signal on an edge area of the touch device under a hover mode;

acquiring multiple second sensing signals on an entire area of the touch device under a touch mode;

determining if there is a touch object on a non-edge area according to the second sensing signals, and when there is a touch object on the non-edge area, determining if the touch object has previously appeared on the edge area according to the at least one first sensing signal; and

when the touch object has previously appeared on the edge area according to the at least one first sensing signal, sequentially outputting multiple sets of coordinates of the touch object on the edge area and on the non-edge area to an operating system for the operating system to identify a swipe gesture.

17. The method as claimed in claim **16**, wherein the step of determining if the touch object has previously appeared on the edge area has a step of determining if a displacement of the touch object moving from the edge area to the non-edge area within a preset time falls within a range of a preset distance when determining that the touch object has previously appeared on the edge area.

18. The method as claimed in claim **17**, wherein the displacement is defined between a first set of coordinates of the touch object on the non-edge area and any set of coordinates of the touch object on the edge area.

19. The method as claimed in claim **17**, wherein the displacement is defined between the first set of coordinates of the touch object on the non-edge area and a last set of coordinates of the touch object on the edge area.

20. The method as claimed in claim **18**, further comprising steps of:

determining if a displacement of the touch object moving from the edge area to the non-edge area within a swipe time exceeds a swipe distance after the operating system sequentially receives the multiple sets of coordinates of the touch object; and

if the displacement within the swipe time exceeds the swipe distance, determining that an edge swipe gesture is identified;

wherein the preset time is not greater than the swipe time and the preset distance is not greater than the swipe distance.

21. The method as claimed in claim **16**, wherein

the edge area has at least one sensing line; and

the step of acquiring the at least one first sensing signal under the hover mode has steps of:

multiplying a sensing signal of each of the at least one sensing line on the edge area by a hover sensitivity parameter; and

converting the sensing signal after the multiplication into one of the at least one first sensing signal.

22. The method as claimed in claim **21**, wherein the step of determining if the touch object has previously appeared on the edge area has steps of:

determining if a sensing value of any one of the at least one first sensing signal on the edge area within a previous sensing frame is greater than a touch sensing threshold; and

determining that the touch object has previously appeared on the edge area when the sensing value of the first sensing signal on the edge area within the previous sensing frame is greater than the touch sensing threshold.

23. The method as claimed in claim **22**, wherein

the edge area has multiple sensing lines; and

the step of determining if the sensing value of any one of the at least one first sensing signal on the edge area is greater than a touch sensing threshold has a step of when the sensing value of the first sensing signal of at least one of the sensing lines on the edge area is greater than the touch sensing threshold, comparing variations of the first sensing signals of the sensing lines on the edge area within a first sensing frame and a second sensing frame previously read to determine a moving direction of the touch object, wherein the first sensing frame is read earlier than the second sensing frame.

24. The method as claimed in claim **23**, wherein

the multiple sensing lines of the edge area include a first sensing line and a second sensing line; and

in the step of comparing variations of the first sensing signals, when the sensing value of the first sensing signal of the first sensing line is greater than the sensing value of the first sensing signal of the second sensing line within the first sensing frame and the sensing value of the first sensing signal of the first sensing line is less than the sensing value of the first sensing signal of the second sensing line within the second sensing frame, determining that the touch object moves from the edge area to the non-edge area, wherein the first sensing line is located between an edge of the touch device and the second sensing line.

25. The method as claimed in claim **24**, wherein

the non-edge area has multiple sensing lines; and

the step of acquiring the second sensing signals on the non-edge area of the touch device under the touch mode has steps of:

reading multiple sensing signals of the sensing lines on the non-edge area;

multiplying the sensing signal of each sensing line on the non-edge area with a touch sensitivity parameter and converting the sensing signal after the multiplication by an analog-to-digital conversion (ADC), wherein the touch sensitivity parameter is less than the hover sensitivity parameter; and

filtering the sensing signal after the ADC to obtain one of the second sensing signals.

26. The method as claimed in claim **25**, wherein the step of determining if there is a touch object on the non-edge area according to the second sensing signals further has a step of determining if a sensing value of any second sensing signal is greater than the touch sensing threshold, and if the sensing value of any second sensing signal is greater than the touch sensing threshold, determining that the touch object is identified on the non-edge area.

27. The method as claimed in claim **20**, wherein

the edge area has at least one sensing line; and

the step of acquiring the at least one first sensing signal under the hover mode has steps of:

multiplying a sensing signal of each of the at least one sensing line on the edge area by a sensitivity parameter; and

converting the sensing signal after the multiplication into one of the at least one first sensing signal.

28. The method as claimed in claim **27**, wherein

the non-edge area has multiple sensing lines; and

the step of acquiring the second sensing signals on the non-edge area of the touch device under the touch mode has steps of:

reading multiple sensing signals of the sensing lines on the non-edge area;

multiplying the sensing signal of each sensing line on the non-edge area with the sensitivity parameter and converting the sensing signal after the multiplication by an ADC; and

filtering the sensing signal after the ADC to obtain one of the second sensing signals.

29. The method as claimed in claim **28**, wherein the step of determining if there is a touch object on the non-edge area according to the second sensing signals has steps of:

determining if a sensing value of any second sensing signal is greater than a first sensing threshold; and

when the sensing value of the second sensing signal is greater than the first sensing threshold, determining that the touch object is identified on the non-edge area;

wherein the first sensing threshold is greater than the second sensing threshold.

30. A touch system of opening window control bar through edge swipe gesture, comprising:

a computer having an operating system installed thereon;

a touch device electrically connected to the computer and having:

an edge area extending inwards a distance from an edge of the touch device; and

a non-edge area;

a display electrically connected to the computer; and

a controller electrically connected to the touch device and the computer, generating a signal for launching a window control bar after an edge swipe gesture is identified, and outputting the signal to the computer for the operating system of the computer to display a window control bar on the display, wherein the controller has following steps to identify the edge swipe gesture:

acquiring at least one first sensing signal on the edge area of the touch device under a hover mode;

acquiring multiple second sensing signals on the an entire area of the touch device under a touch mode;

determining if there is a touch object on an non-edge area according to the second sensing signals, and when there is the touch object on the non-edge area, determining if the touch object has previously appeared on the edge area according to the at least one first sensing signal; and

when the touch object has previously appeared on the edge area according to the at least one first sensing signal, the edge swipe gesture being identified.

31. A method of identifying edge swipe gesture, comprising steps of:

scanning a touch device under a hover mode to acquire hover information of an edge area of the touch device; and

scanning the touch device under a touch mode to

determine if a touch object has touched a non-edge area of the touch device under the touch mode;

when there is the touch object on the non-edge area, determining if the hover information, which is previously acquired under the hover mode, includes touch object information; and

when the hover information includes the touch object information, generating a signal indicating that a movement of the touch object corresponds to an edge swipe gesture.

32. The method as claimed in claim **31**, wherein the signal is a hot key signal.

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